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BY: J. NOWAKOWSKA AND R. WIEBE

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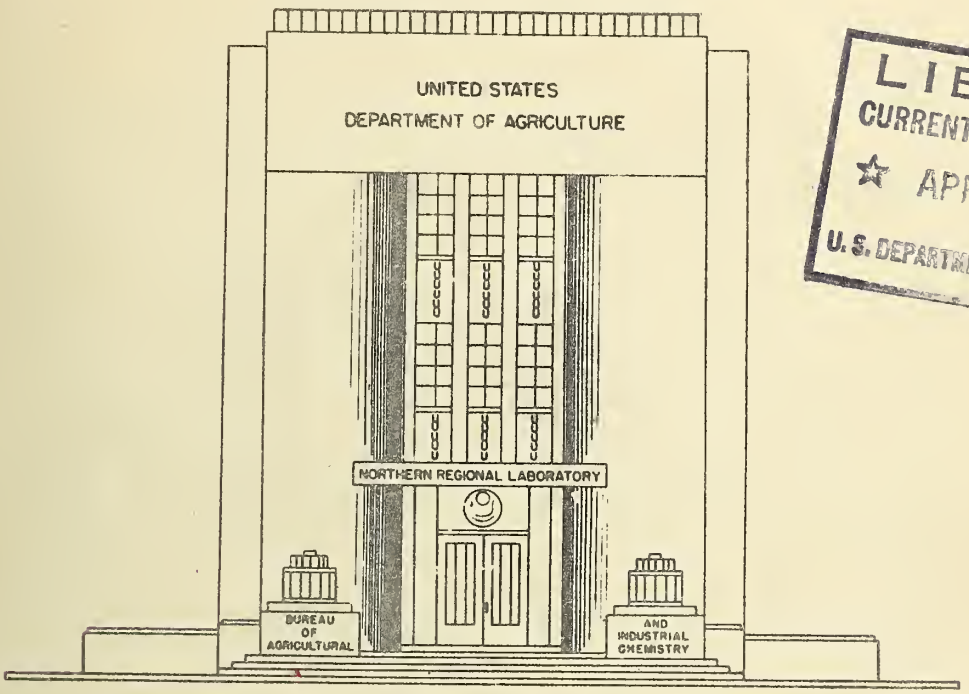
UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Agricultural and Industrial Chemistry

Bibliography on

CONSTRUCTION, DESIGN, ECONOMICS, PERFORMANCE, AND THEORY OF PORTABLE AND SMALL STATIONARY GAS PRODUCERS



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By

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NORTHERN REGIONAL RESEARCH LABORATORY
PEORIA, ILLINOIS

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INTRODUCTION

The information contained in this bibliography was compiled whenever possible from original sources, but considerable material was also obtained from Chemical Abstracts, British Chemical Abstracts, and the Engineering Index. The formal reference abbreviations are those recommended by Chemical Abstracts. In addition, a large number of references will be found for which insufficient information was available at the Laboratory.

A number of references are included on the use of compressed gases such as "illuminating" gas and acetylene, as well as on subjects closely related to the work, since some of the problems encountered there are of immediate interest to producer gas practice. No attempt, however, was made to cover the various fields.

In the subject classification, references were grouped according to what appeared to be the predominant subjects and the same reference will in some cases be found under a number of headings but cross indexing has been kept to a minimum. The user should therefore look under more than one heading if more than cursory information is needed. Under each of the subject headings, references are arranged alphabetically according to titles. The following headings were chosen: Books, Design and Construction, Economics, Engine Test, Fuel, Hazards, Miscellaneous, Purification, and Theory.

The length of the abstract does not always do justice to the importance of many articles and a considerable number of articles have undoubtedly been omitted.

An alphabetical author index with page references will be found at the end of the bibliography.

The assistance of Misses Opal M. Fry and Wanda C. Pringle in compiling this information is acknowledged with thanks.

BOOKS

Le bois carburant
Dupont, Georges
Paris: Gauthier Villars et Cie, 1941, 116 pp.

Les carburants de remplacement et les gazogènes
Vuilleumier, H. O.
Bern: Hallwag, Dept. "Revue Automobile," 1941, 264 pp.
The second part of the Book (112 pp.) is devoted to wood and charcoal gas generators. The manufacture of charcoal in Switzerland is discussed, and a list of producers is given. The operation and care of gas generators are outlined in great detail, past experience with gas generators is cited; and a number of gas generators, particularly of Swiss make, are described.

Les carburants de remplacement et leur technique; gaz pauvre au gaz de carbone, benzol, alcool, naphthaline, méthane, acétylène, acétone, et alcool méthylique, l'automobile a acétylène
Christille, M.
Paris: E. Chiron, 1944, 73 pp.

Carburants et combustibles de remplacement II. Combustibles de remplacement: Utilisation rationnelle du bois de chauffage
Ballu, Tony
Paris: Imprimerie, Crété, 1942, 62 pp.

Le carburant forestier: Étude économique et générale en France et dans le monde
Mazodier, B.
Paris: Dunod, 1939, 265 pp.

Driving and serving manual
British Gazogenes Ltd.
London: British Gazogenes Ltd., 1940, 15 pp.

Etudes des gazogènes portatifs. Historique, description, fonctionnement, utilisation
Rouyer, Pierre
Paris: Dunod, 1938, 75 pp.

Fahrzeug-Diesel motoren und Fahrzeug-Gas-Generatoren in Wirkungsweise, Bau Betrieb und Anwendung
Fiebelkorn, Heinz
Berlin: Union Deutsche Verlagsgesellschaft, Roth & Co., 2nd ed., 1938, 285 pp.
In about 25 pages author discusses briefly operation, installation, general types of vehicle gas generators, various principles of ignition and describes 7 generators of German make.

Force motrice par le gaz des forêts
Coupan, Gaston
Paris: La Maison Rustique, 1942, 322 pp.

Gas producers for motor vehicles
Allcut, E. A. and Patten, R. H.
Can., Natl. Research Council, Repts. No. 1220, 1943, 162 pp.
The authors give detailed results of stationary and road tests on a number of gas generators. Test procedures are outlined. Excellent advice is given to prospective builders and users of such equipment.

Le gaz des forêts. Carburante forestiers. Gazogènes
Lepoivre, A. and Septembre, G.
Paris: Soc. Natl. d'encouragement a l'utilisation des carburants forestiers, 1938, 206 pp.

Les gazogènes: Constitution, fonctionnement, usage
Touvy, A. M.
Collection Baudry de Saunier, Ernest Flammarion, Editor.
Paris: 26 Rue Racine, 1943, 144 pp.
The author discusses in considerable detail the following items: Principles of operation, fuels, details of construction of generator and accessories, installation of generator assembly in vehicles, operation and care when driving, and finally precautions to be observed. Sixteen generators, principally of French manufacture, are described.

Les gazogènes pour automobiles
Principes, Installation, Conduite, Entretien.
Septembre, G. and Lepoivre, A.
Paris: 40 Rue de Seine; Clermont-Ferrand: 8 Rue Rameau, 1940, 144 pp.
After discussing the properties of wood and charcoal, authors discuss the principles of the generator, the necessity of heat interchange and purification, gas-air mixing, and precautions. This is followed by description of several types of gas generators and of the adaptation of a standard gasoline engine to producer gas.

Gasógenes
Paz, A. M.
Madrid: Sucesores de Rivadeneyra, s.a., 1941, 44 pp.
Gas producers, motor vehicles.

Generator Jahrbuch 1942. Gasgeneratoren in Theorie und Praxis
Ostwald, Walter, Editor
Berlin: J. Kasper and Co., 1942.

Grundlagen der Holzgasanlagen für ortfesten und fahrbaren Betrieb mit Berücksichtigung der Fahrzeuggasanlagen für Holzkohle und Ähnliche Brennstoffe
Jaeger, Lujo
Novi Sad (Jugoslavia) 1935, 184 pp.

Herstellung und Verwendung von Holzgas
Tobler, J.
I. Schweiz. Kongr. Förderung Holzverwert. Bern 1936, 28 pp.

Hochleistungs Gaserzeuger für Fahrzeugbetrieb und ortfeste Kleinanlagen
Finkbeiner, H.
Berlin: Julius Springer, 1937, 99 pp.
A comprehensive booklet giving information on all phases of the use of producer gas such as on fuels, combustion, engine performance, generator design, and accessories.

Holz und Holzkohlen Gaserzeuger für Kraftfahrzeuge
Kühne, G. and Koch, F.
Berlin: Beuth-Verlag, 1935, 67 pp.

Kampf um Treibstoff. Nationale Treibstoffwirtschaft
Machemer, H. and Reismann, O.
Frankfurt A. M.: Fritz Knapp, 1936, 172 pp.
Generator gas is briefly mentioned as one of the possible substitute fuels.

Kraftwagen Sauggaserzeuger für Holz und Holzkohle Entwicklung, Einbau und Betrieb
Thölz, W.
Berlin: Richard Carl Schmidt and Co., 1936, 141 pp.
After general considerations, author discusses in detail 7 different makes of gas generators and gives briefly the experiences obtained in practical operation.

O que devemos saber dos gasogénios
Volante, O.
Lisbon: Publica-Le Temporàriamente, A5EA, 25 De Cada Mes, 1942.

Le problème de la réactivité des combustibles solides,
Guérin, Henri
Paris: Dunod, 1945, 222 pp.

Prove sui gasogeni construiti in Italia per autoveicoli
Instituto Nazionale dei Motori
Naples: Fondazione Politecnica del Mezzogiorno, 1940, 167 pp.
The book deals with gas producers and motor fuels.

Theoretische und Praktische Untersuchungen über den Betrieb von Motorfahrzeugen mit Holzgas
Schläpfer, P. and Tobler, J.
Bern: Gesellschaft für das Studium der Motorbrennstoffe, 1939, 277 pp.

Die Veredlung gasförmiger Brennstoffe
Heinze, Richard
Leipzig: Akad. Verlagsges., 1934, 70 pp.

Le verita sul gasogeno
Prisco, Silvio
Rome: Via Della Mercede 33, 1940, 254 pp.
After discussing fuels, principles of operation, purification of gas, and carburation, the author describes 15 gas generators of Italian manufacture.

DESIGN AND CONSTRUCTION

Acetylene as motor fuel
Clarke-Jones, N.
Chem. and Ind. 1942, 368.
A portable C_2H_2 generator used in Switzerland and suitable for use with a motorcar is described. When compared to gasoline, speed is reduced by 10%; acceleration is good and starting practically instantaneous.

Advanced producer gas washing plant
Morison, W. J.
Comm. Motor 74, 473 (1942).
This article describes briefly specifications of Brit. Pat. 541,533 in which the use of a two-stage liquid cleaner, followed by a separator for producer gas purification, is advocated. The use of this arrangement was greatly reduced engine wear in vehicles operated by the Eastern National Omnibus Co.

Apparatus for cleaning, e.g., producer gas on automobiles
Koela Producer - Gas Plant Co., Ltd., and Goldman, B.E.M.
Brit. Pat. 473,195, October 4, 1937.

Apparatus for producing generator gas free of tar from materials of vegetable origin containing tar
Krack, Georg (To Deutsches Reich, Vertreten durch den Reichforstmeister)
Ger. Pat. 708,383, June 12, 1941.

Apparatus suitable for domestic gas manufacture from corncobs, waste straw or other vegetable refuse
Gold, J. K.
Brit. Pat. 353,221, September 9, 1929.
Apparatus consists of a retort, furnace, condensers, and gas holder.

Arrangement for the combustion of the excess gas from producer gas generators and the waste gas from gas motors driven by producer gas
Meixner, Gottfried (To Klöckner Humboldt - Deutz A.G.)
Ger. Pat. 711,023, August 21, 1941.

Automatic mixer for producer gas engines
Schimanek, Emil
Automobiltech. Z. 46, 327-35 (1943); The Engineers' Digest, Am. Ed. 1, (6), 36 (1944).
An arrangement for maintaining a constant heating value of gas from one-fourth to full load is described. The advantages of a six-stroke engine in controlling air supply to generator and mixer are pointed out. Two devices to inject water into the air stream are described. Serious trouble is encountered with wood of high water content and a condenser arrangement for prevention is shown. A mixture control for stationary engines is shown which automatically maintains the pressure of the air

and gas at the same value. A slight modification is incorporated to provide for richer mixtures. For vehicle engines additional features are necessary. In order to increase output beyond that obtainable with gas only, an arrangement for the controlled injection of fuel is shown, particularly suitable for Diesel-gas engines. An auxiliary device is incorporated which automatically cuts off liquid fuel supply when coasting.

Beobachtungen an Fahrzeug-Gasserzeugern bei Verwendung fossiler Brennstoffe
Finkbeiner, H.
Automobiltech. Z. 39, 616-8 (1936).
Results of experiments are reported on the use of portable gas producers with coal, coke, and similar fuels.

Betrachtungen über die Holzgaserzeuger auf der Berliner Automobil Ausstellung 1933
Kühne, G. and Koch, F.
Die Technik in der Landwirtschaft 14, 95-7 (1933).
Authors describe briefly some of the exhibits and conclude that the prime consideration for the manufacture must be simplicity and reliability.

Brush-Koela duo-draft gas producer
Anonymous
Passenger Transport J. 82, 31-3 (1940); Ibid. 81, 217-8 (1939).

"Brush-Koela" gas producer
Anonymous
Passenger Transport J. 84, 20-1 (1941); cf. Ibid. 82, 31-3 (1940).
A Brush Koela updraft gas generator of improved design is described. Ample dimensions give a low pressure drop and thermal value of gas is high with consequent low fuel consumption. Steam injection into primary air keeps the combustion temp. below the fusion temp. of the ash.

Construction et montage des gasogenes (extraits de documents officiels)
Ministère de la Production Industrielle et du Travail
Chiron, E., Editor
Paris: 40 Rue de Seine, 1940, 27 pp.
Types and standards of gas generators required by French Government are described.

The conversion of compression ignition engines to producer gas operation
Michalski, W. and Spiers, J.
J. Inst. Automobile Engrs. Automobile Research Committee, Confidential Bull. No. 1944/3, 1944, 35 pp. Engineering 158, 98, 118, 138, 158, 198 (1944).
No major alterations are required to the engine structure to convert it to producer gas operation, the only additions being a suitable form of injection pump control linked to a gas/air mixer and a new induction manifold. Bench and road tests performed.

The conversion of Diesel engines to producer gas operation
Anonymous
Génie civil 120, 244 (1942). Abstr. in J. Inst. Automobile Engrs. 12, (7), XXIX (1944).
Diesel engines can be converted to the use of fuels other than heavy oil by providing electrical ignition, gas mixer, and manifold; the compression-ratio is usually reduced to prevent pre-ignition. Examples of successful conversion to sewage gas operation are quoted. All industrial gases can be used, producer gas being particularly suitable. The producer may be operated by engine suction or by a blower.

Conversion of Diesel motors to operation on wood distillation gas
Vogel, Wolfgang
Holztech. 22, 150, 152 (1942).
Wood distillation gas may be used in stationary Diesel engines if 10-15% of the former requirement of fuel oil is added. Use of the gas in a spark ignition engine would necessitate structural changes in order to increase compression-ratio for greater efficiency. The wood distillation plant and gas purification system are described briefly and the av. composition in %, of the gas given (CO_2, 13; CO, 13.8; H_2, 16; CH_4, 2.9; N_2, 54.3).

Converting two-stroke engines for producer gas operation
Planiol, M.
Automobiltech. Z. 46, 186-7 (1943); The Engineers' Digest, Am. Ed. 1, (9), 515 (1944).
Two-stroke Junkers type opposed-piston engines were converted for running on producer gas. To avoid mixing of air and gas outside the cylinder, an additional reciprocating pump was fixed on each cylinder head, the piston of which is secured to the scavenging piston. This device draws the gas from the producer and pumps it into the ignition chamber. Two spark plugs are installed to guarantee ignition at all loads. The chief problem is to maintain the temporary low pressure in the cylinder for a sufficient time and to prevent the back-flow of the oscillating exhaust gas.

Diesel and gas engines for tractors
Anonymous
Gas Oil Power 40, 167-169 (1945).
The Hanomag 5.2 l. four-cylinder tractor Diesel engine was re-designed for producer gas use. Test runs showed that change in fuel resulted in a decrease in output from 40 B.H.P. to 32 B.H.P. at 1,200 r.p.m., i.e., by 20%; at 800 r.p.m. the decrease amounted to 22%. To keep the output to the full Diesel value without making essential changes in Diesel design or increasing the speed, the cylinder bore was increased from 105 to 110 mm. This step increased the piston-swept volume from 5.2 to 5.7 l. A compression-ratio of 13-1/2 to 1 was found to be safe in this respect. This application of increased bore and increased compression-ratio to the Diesel model has raised its output to 46 B.H.P. at 1,200 r.p.m. when running on producer gas with the use of hard wood fuel of 10% moisture content.

Downdraft gas generator, particularly for vehicles
Abée, Ernst
Ger. Pat. 631,117, June 12, 1936.

Downdraft gas producer
Zeuch, Alfred (vested in the Alien Property Custodian)
U.S. Pat. 2,306,030, December 22, 1942.
Various structural and operative details, suitable for use with wood, peat, lignite, or the like, are given.

Downdraft suction gas producer
Pal, R. and Vilmos, S.
Brit. Pat. 245,781, June 12, 1925.

Electrical equipment of producer gas engines
Busselmeier, O. and Weber, W.
Motortech. Z. 8, 315 (1942). Abstr. in J. Inst. Automobile Engrs. 13, (2) XIII (1944).
Conversion of spark ignition and Diesel engines to producer gas operation involves the use of a more powerful ignition coil. Distributors have been developed which can be fitted in place of the fuel pumps.

Emergency gas supplies for factories
Anonymous
Power and Works Engr. 36, 137-9 (1941).
Description of self-contained portable producer unit to provide emergency gas supply to factories affected by enemy action.

Evolution of gas generators for automobiles
Charles-Roux, A.
10th Congr. of Chimie Industrielle. Chimie et industrie, Spec. No. 25, March 1931.
Author emphasizes various new principles which must be adapted in the construction of small generators.

Fahrzeuggaserzeuger und Treibstoffe in Belgien
Gümz, W.
Feuerungstech. 29, 99-100 (1941).

Feste Brennstoffe im Generatorbetrieb auf Strassenfahrzeugen
Schultes, W.
Brennstoff - Chem. 17, 61-7 (1936).
Different installations are described and discussed.

Filter cooler for producer gas plants
Anonymous
Engineer 168, 529 (1939).

Filtration or cleaning of producer gas, more especially for use in internal combustion engines
British Gasogenes, Ltd. and Griggs, A. R.
Brit. Pat. 539,403, April 23, 1940.
A method is described for heating or preventing the undue cooling of producer gas before it reaches the filtering or cleaning medium; in this way condensation of H_2O in the filter is prevented. Exhaust gases may provide the source of heat.

Gas generators
Midol-Monnet, E. A.
Fr. Pat. 838,252, March 2, 1939.
A downdraft gas generator with truncated-cone-shaped furnace is described, into center of which the air is introduced at high velocity. The orifices are adjustable permitting the creation of a zone of high temperature above but as near as possible to the constriction which promotes the destruction of tar and dissociation of steam. Water supplied to the generator is atomized, and it vaporizes instantaneously as it passes the exterior wall of the furnace.

Gas generator, especially for motor vehicles
Fischer, Otto (To Schürmann and Schultz)
Ger. Pat. 736,115, April 29, 1943.

Gas generator for motor vehicles
Isendahl, Herbert (To Hisco. Fahrzeug-Gasgeneratoren Grau, Isendahl and Co., Kom. Ges.)
Ger. Pat. 711,186, August 21, 1941.

Gas generator for vehicles
Hansa-Gas-Generatoren G.m.b.H. (Lutz, Hans, inventor)
Ger. Pat. 666,245, October 13, 1938.
Ger. Pat. 672,189, February 22, 1939.
Ger. Pat. 673,391, March 21, 1939.

Gas producer
*C.U.R.A. Patents Ltd. (London) and Hales, J. S.
Brit. Pat. 539,440, September 10, 1941. Engineering 153, 20 (1942).
A downward-feed generator having an annular plate extending inward above the firebox designed to overcome channelling and irregularity of combustion. Air and steam are introduced in a radial direction without the use of tuyères, gratings, etc. A slightly conical or flat revolving solid grate with fixed, curved blades spaced away from the neck to allow discharge of ash, etc. is provided. Various additional features are described.

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*Coal Utilization Research Association.

Gas producer
Heumez, P. and Hubert, E.
Fr. Pat. 649,927, December 29, 1928.
A downdraft gas generator is described in which the gas passes through an opening located above the grate, the purpose being to prevent the tarry material to pass along with the gas.

Gas producer
The Wellman Smith Owen Engineering Corp., Ltd. and Schieldrop, B. H.
Brit. Pat. 553,712, June 2, 1943. Abstr. in Engineering 156, 480 (1943).
In order to overcome the tendency of the air to pass more freely up the side walls, an adjustable conical deflector just below the feed charging opening will distribute the feed in such a manner that the highest part of the fuel bed is at the walls.

Gas producers
Adams, N. A.
Brit. Pat. 546,936, Bellay Ltd., February 19, 1941.
A H_2O-jacketed tuyère for a gas producer has baffle plates in the H_2O spaces at the sides of the tuyère so arranged that the H_2O flows down to and cools the end of tuyère exposed to the highest temp.

Gas producers
Bennett, J. G., Heywood, H., Brown, R. L., Thring, M. W. and
*C.U.R.A. Patents Ltd.
Brit. Pat. 535,576, October 12, 1939 and November 3, 1939.
A producer suitable for use with an internal combustion engine has a gasification chamber formed between an inclined grate and a similarly inclined upper wall. Fuel is fed into this chamber from a superimposed hopper and descends gradually between the grate and the wall without exerting any substantial pressure on the latter. Air enters through one or more ports in the wall and passes transversely through the fuel bed, the producer gas formed being withdrawn through the grate.

Gas producers
*C.U.R.A. Patents Ltd. and Hales, J. S.
Brit. Pat. 539,440, March 7, 1940 and May 9, 1940.
Downward feed-type producer, particularly suitable for fuels comparatively free from tar but capable of ready ignition, is described.

Gas producers
Irving, F. A.
Brit. Pat. 542,906, June 4, 1940.
A producer suitable for gas-driven motor vehicles is described.

Gas producers
The Gas, Light and Coke Co. and Lawrence, H. H.
Brit. Pat. 523,041, December 23, 1938. Engineering 150, 340 (1940).
The object of the invention is to minimize the formation of clinker round the point of entry of the air blast.

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*Coal Utilization Research Association.

Gas producers
Thornhill, R. H. and Moppett, R. G.
Brit. Pat. 558,400, August 17, 1942.
A small producer suitable for vehicles is described.

Gas producers
Waugh, I. V.
Brit. Pat. 553,167, July 31, 1941.
Supply of air to and withdrawal of clinker from the combustion zone are effected through a cylindrical tunnel fixed to the side of the producer shell and extending inwards into the fire zone. The tunnel is provided with a removable air-intake unit, and both are preferably H_2O-jacketed.

Gas producers
Willans, K. and Kennedy, D. S.
Brit. Pat. 526,227, March 9, 1939.
Cross-draft type has a displaceable bottom portion in which the ash accumulates. This portion can be progressively lowered.

Gas producers and method of operation
Fehling, H. R. and Rosin, P. O.
Brit. Pat. 559,916, August 12, 1942.
A method of operating downdraft type of producer is described. Powdered fuel, pitch, or tar may be gasified.

Gas producers as applied to transport purposes
Lowe, Robert
J. Junior Insts. Engrs. 50, 231-53 (1940).
Principles of gas generator operation and the requirement of generators for transport purposes are discussed.

Gas producer construction for gasifying rice hulls, etc.
Schmidt, Kurt
Brit. Pat. 325,616, December 5, 1928.

Gas producers for buses
Gumz, W.
Feuerungstech. 31, 9, (1943). The Engineers' Digest 4, 337 (1943); Am. Ed. 1, 87 (1944).
A description of two-wheel trailer-type producer used in Sweden to operate buses since 1939 is given. It consists of actual producer, gas cooler, purifier and bunker. Charcoal, wood and coal are used as fuels, coal being most advantageous. Engine operation is described. Cost of fuel listed.

Gas producers for marine engines
Science Museum
London: Science Museum, Science Library Bibliography Series No. 488, 1939, 5 pp.

Gas producer for motor vehicles
Anonymous
Iron and Coal Trades Rev. 140, 40 (1940).
Design and operation of a Brush-Koela duodraft generator is described. Actual experience with a one-ton truck demonstrated that solid fuel costing 3 pounds sterling was equivalent to 180 gal. of gasoline costing more than five times the above amount.

Gas producers for motor vehicles
Anonymous
Automobile Engr. 32, 433-64 (1942).
Some of the British gas producers are described and illustrated: Government Emergency C.U.R.A., B.V.P., Bellay, C. & W., Cowan, Enness-Sentinel, H.M.L., H.S.G., and British gasogenes.

Gas producers for motor vehicles
Westerkamp, L.
Oel u. Kohle 38, 1106-8 (1942).
Diagrams are given of portable gas generation of the up-, down-, and cross-draft types. To prevent abrasion and corrosion in case of various types of mineral fuels, dust and S must be carefully removed. This is effected by chemical and mechanical means. Corrosion is due to Si-S compounds. Gas should be cooled to at least 30° C. for greater engine efficiency. Wood has the advantage of low S, soft ash, uniformity of composition, low ignition temps. Peat is usable; however, ash must not exceed 3%, S content must be low and moisture content not greater than 20-25%. Max. specified figures for anthracite are: Moisture content, 5%; ash, 5%; combustible S, 1%; volatile matter, 8%. The specific fuel consumption for various fuels is given.

Gas producers for motor vehicles
Johnson, E. B., Amalgamated Anthracite Collieries, Ltd., Mathew, H.F.E., and South Wales Transport Co., Ltd.
Brit. Pat. 550,033, September 18, 1942.

Gas producers for motor vehicles and their operation with forest fuels
Anonymous
Imperial Forestry Bureau, Oxford Technical Communications No. 1, 1942.
Intern. Sugar J. 44, 135 (1942).
Theory of producer gas; the generator; cleaning and cooling apparatus; mixing valve and controls; layout, weight and cost of producers; loss of power and performance; driving and maintenance; charcoal fuel; operating costs; wider aspects.

Gas producers on lorries in France
Anonymous
Engineer 164, 110 (1937).
A detailed description and diagrams of Gohin-Poulenc and Panhard gas producers. The Franco-Belge, Berliet and Grande-Combe producers are only briefly described with no illustrations.

Gas producer plant
Mackenzie, I. E.
Brit. Pat. 546,458, July 20, 1939.
Cross-draft type of generator in a metal casing without refractory lining is described. The air supply is preheated before reaching the tuyère, H_2O is converted into steam by the heat radiated from the casing. The gas produced passes through a centrifugal cleaning device to a linen filter and air-gas mixer, and then to the engine.

Gas producer plant for use with internal combustion engines
Comp. de Carris, Luz e Força do Rio de Janeiro, Ltda.
Brit. Pat. 551,988, August 15, 1941.
An arrangement of producer, coolers (operated two in parallel and two in series), and filters (two in parallel) especially for vehicles is described.

Gas producer sets primarily intended for use with motor vehicles. Gas cleaning and filtering
Sentinel Waggon Works (1936) Ltd. and Alley, S. E.
Brit. Pat. 539,794, March 19, 1940 and January 17, 1941.

Gas producer suitable for motor vehicles
Delvaux, M.
Belg. Pat. 354,149, October 31, 1928.

Gas producer suitable for use with internal combustion engines
Generateur Rex Soc.
Brit. Pat. 271,905, May 31, 1926.

Gas producer units. Start of mass production
Anonymous
Australian Timber J. 7, 266 (1941).

Gas producer (with a rotary cover and an agitating device eccentrically mounted on the cover).
Koller, Karl
U.S. Pat. 2,143,987, January 17, 1939.
Structural, mechanical, and operative details are given.

Gaserzeuger für Kraftwagen
Finkbeiner, H.
Z. Ver. deut. Ing. 79, 665-7 (1935).
Discussion of the latest developments in the German gas producer industry. Illustrations and some detailed drawings are given.

Gaserzeuger für Reishulsen und ähnliche pflanzliche Abfallstoffe
Humboldt-Deutzmotoren A.-G.
Ger. Pat. 592,608, February 10, 1934.
A downdraft gas producer has an adjustable overhead air inlet with cone-shaped outlet. There is no constriction at the hearth and a mechanical agitator is provided for removal of ash or clinkers.

Gaserzeuger mit abwärts gerichtetem Zug und zweifacher Luftzuführung
Studien und Verwertungs G.m.b.H.
Ger. Pat. 646,277, May 20, 1937.
Ger. Pat. 654,107, December 10, 1937.

The gasification of wood and wood charcoal
Dupont, Georges
Bull. soc. encour. ind. natl. 141, 1-15 (1942).
The best known French gas generators are described.

Gasogens
Miller, R.H.P.
Madison, Wisconsin, U.S. Dept. Agr. Forest Prod. Lab. 1944, 5 pp.
(Mimeo. No. R1463).
After a brief statistical summary, purpose of investigation is explained. Almost any type of solid fuel such as nut shells, coke, wood, etc. can be used; however, a good grade of charcoal is best for reasons explained. Construction, as well as principles of gas generators and operation, are described and precautions are emphasized. Without modification the engine will deliver only about 50% of the power running with producer gas than when running with gasoline. This may partially be overcome through increase of C.R. Results of road tests using charcoal and sawdust are shown.

Gassogeni per autoveicoli
Moscarini, Flaviano
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 1-10.
The report deals with combustion of materials; mechanical equipment of the generator and its installation on the car, and with gas-fed motor itself. Descriptive.

Les gaz des forêts
Keuleuan, L.
Aerophile 48, 174-7, 200-3 (1940).
Wood producer gas and various types of portable gas producers are discussed.

Les gazogènes
Rouyer, Pierre
J. soc. ing. automobile 12, 401-14 (1939).
Gas producers operation principles are discussed on the basis of detailed diagrams. Illustrated description of types and economic features are given.

Les gazogènes aux colonies
Rolland, M.
Rev. Int. Bois 4, 235-85 (1937).

Les gazogènes d'automobiles
Larguier, Louis
Rev. Int. Bois 4, 74 (1937).
General article on gas producers.

Government unit. The mark VI, designed for light-weight commercial vehicles
Anonymous
Automobile Engr. 32, 462 (1942).
A new unit developed from the mark V type. It is intended for vehicles fitted with gasoline engines of from 3-1/2 to 4 l. capacity. Water injection device and a new form of filter improve general performance of the plant when used with a wide range of fuels. Details of the producer design are given.

Le grandi centrali termiche a gas prodotto da combustibili indigeni
Crossley, Soc.
III° Congresso Internazionale del Carbonio Carburante, 4th Session, Substitute Colonial Fuels, Rome, September 1937, pp. 17-26.
The report deals with the experience obtained over long periods of time from the operation of stationary gas producers, utilizing raw materials of vegetable origin as fuels. The gas is used to supply electric power for mining operations in Africa and Australia. Technical and economic advantages are cited.

Das Holz als Kraftstoff
German Forestry Association
Mitteilungen des Ausschusses für Technik in der Forstwirtchaft Heft No. 5, 171-234 (1933).
History, economics, theory and practice of wood and charcoal producer gas in Germany; most important types of wood gas generators: Imbert, Deutz, Oberberbach, and "Abogen". Practical experiences with these generators. A brief survey of wood-gas production in countries outside of Germany.

Holzkohlengas als Treibmittel für Kraftfahrzeuge
Kühne, Georg
Z. Ver. deut. Ing. 78, 1241-2 (1934); Ibid. 78, 325-7 (1934).
Gas generator operation using charcoal is described.

Holzgaserzeuger für Lastwagenantrieb
Finkbeiner, H.
Z. Ver. deut. Ing. 84, 645-50 (1940).
The charcoal produced in the gas generator tends to disintegrate more readily the softer the wood and the higher the temp. in the fire. Soft wood gives a poorer performance than hard wood. The wetter the wood, the lower is the heating value of the gas. Wood containing over 36% moisture is not usable. Wood broken in pieces of 30-50 sq. cm. and air-dried to about 15% moisture is best for use in trucks. Seven gas producers are described. 36 references.

I Gassogeni nella trazione automobilistica
Mazzucato, B.
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 85-100.
A survey of the evolution undergone by automobile gas generators in Italy and description of all the types of gas generators which have been adopted.

Improved gas producer for use with internal combustion engines
Vauxhall Motors Ltd., Taub, A., Foster, D. B., Platt, M. and Biraben, H. E.
Brit. Pat. 534,505, November 25, 1939, May 23, 1940, and March 7, 1941.
A cross-draft producer with water-cooled tuyères and with manually or automatically-operated reciprocating ash-removing device is described.

An improved gas producer for use with solid fuels such as wood, peat, straw, and the like
Donald, G. H.
Brit. Pat. 528,284, March 5, 1939, October 25, 1940.
Tuyères arranged in the angles formed by the sides of a firebox of polygonal cross section and projecting into the firebox in such a way as to ensure the complete incandescence of the charcoal. A perforate septum across the firebox by constricting the passage of an air-gas mixture raises its velocity and consequently the temp. of the charcoal. The products distilled from fuels are "cracked" into combustible products which increase the calorific value of the gas mixture.

Improved gas producer for use with wood and the like
Imbert, George
Brit. Pat. 279,475, March 15,1928.
A producer is described in which wood, peat, and other vegetable fuels may be used.

An improved uction gas producer
Bolden, L. W.
Brit. Pat. 534,858, March 20, 1941.
The producer is in two sections connected by a junctional casting. The lower section encloses a downwardly-extending casing constituting the firebox from which the fuel is fed to a removable grate, below which is a H_2O reservoir for supplying steam to the incandescent zone. Means are provided for operating the producer with humidified air on either the up- or down-draft system.

Improvement by thermal means of the efficiency of automobile gas producers using wood
Lutz, Hans
Feuerungstech. 29, 186-9 (1941).
Experiments show that the calorific value of the gas-air mixture from wood gas producers mounted on vehicles can be considerably raised by reducing heat losses, e.g., by recovery of the sensible heat of the gas, and the use of heat from the engine exhaust gases. The producer is thereby made less sensitive to the H_2O content of the wood.

Improvements in gas producers
Widegren, K. A. and Widegren, E. H.
Brit. Pat. 280,912, July 5, 1928.
The invention consists chiefly of arranging all air inlets at substantially the same horizontal level in the walls of the reaction chamber to permit uniform distribution of air over total combustion zone.

Improvements in gas producers for vehicles
Fitton, A. and Hurley, T. F.
Brit. Pat. 527,775, October 16, 1940 and April 6, 1939.
Ash-removing device.

Improvements in or relating to gas producers
Bennett, J. G., Heywood, H., Brown, R. L., Thring, M. W. and C.U.R.A. Patents Ltd.
Brit. Pat. 535,576, April 15, 1941.
Gasification chamber formed between an inclined grate and a similarly inclined upper wall. A propelling mechanism is provided between the lower ends of the grate and wall to eject the clinker and ensure uniform movement of the fuel in the chamber.

Improvements in or relating to gas producers
Willans, K. W. and Kennedy, D. S.
Brit. Pat. 526,227, March 9, 1939 and September 12, 1940
Cross-draft type, suitable for internal combustion engines has a displaceable bottom portion in which the ash accumulates; this portion can be progressively lowered so as to keep the fire zone at the same level. Devices for maintaining a gas-tight joint between the body of the producer and the bottom portion are described.

Improvements in or relating to gas producers, refuse destructors, and other furnace apparatus
The Wellman Smith Owen Corp. and Schieldrop, B. H.
Brit. Pat. 546,482, December 18, 1942. Abstr. in Engineering 154, 500 (1942).
Fuel and ashes form a continuous body down to the bottom of the apparatus. Air is supplied to the fuel bed through the sloping surface of the cone of ashes. The space about the bottom of the shell is enclosed and partitioned into sectors so that the supply of air to each sector can be separately controlled to ensure uniform combustion in the fire zone.

Improvements in or relating to producer gas generators
Morrison, A. C. and Morrison, A. E.
Brit. Pat. 535,706, October 14, 1939 and April 18, 1941.
A gas producer is provided with two or more orifices for the air supply, one orifice being of such size as to provide a small quantity of air at high velocity for slow running of the engine, and the other to give large volumes of air at substantially the same velocity, so that a gas of uniform quality is produced at all loads. The orifices may be controlled either manually or automatically in accordance with the gas requirements.

The improvement of vehicle wood-gas producers by thermal precautions
Lutz, Hans
Automobiltech. Z. 43, 589-95 (1940); 44, 142-8 (1941).
The performance of the wood-gas producer can be materially improved by heat exchange between the exhaust gas and the fresh air. Further improvements can be made, e.g., by removal of H_2O from the gas and by thoroughly insulating the gas producer. With these improvements, the lower heating value of the gas can be increased from 1,188 to 1,420 kg.-cal. Further, the permissible H_2O content of the wood can be materially higher (about 40-50%) than the present limit of 15% H_2O.

Injection nozzle for gas producer and gas producer adapted to use said nozzle
Poncet, J.L.P. and Vallernaud, J.P.A.
Brit. Pat. 527,445, October 9, 1940.
In a suction producer the air flow in a Venturi nozzle draws in the max. quantity of H_2O at full load only; at other loads the excess of H_2O bubbles down an outside overflow.

Italian gas producers
Anonymous
Transport World 88, 70 (1940).
The "Nostrum" downdraft gas producer suitable for coal and charcoal is described. The firebox has a refractory lining. Air is admitted by means of three narrow concentric slits surrounding mouth of the fuel box.

Jacketed gas generator, especially wood-gas generator for vehicles
Ahlen, Franz
Ger. Pat. 737,683, October 6, 1943.

The Koela gas producer for road vehicles
Anonymous
Engineering 147, 630 (1939).
Description of gas producer manufactured by Koela Producer Gas Plant Co., London, using anthracite, low-temp. coke, or charcoal, as fuel; air for combustion in engine is drawn through mushroom valve controlled by driver.

Lorry, 3-ton, 4-wheeled sentinel H.S.G. with gas producer plant.
Great Britain, War Office
London: War Office 1940, Minute B3, 615, 5 pp.

Low-grade gas fuels, their production and utilization
Valle, Ricardo del
Mem. 16th conf. anual, Asoc. téc. azucar. Cuba 1942, 121-42.
Various types of portable gas producers are described.

The modern portable gas producer
Goldman, B. and Clarke-Jones, N.
J. Inst. Fuel 12, 103-40 (1939); Engineer 166, 712, 740 (1938).
A comprehensive survey of the gas producer field. Many aspects of the subject are considered: Past developments, theory, producer-gas plants, design of generators, gas purification, fuels, gas produced, fuel consumption, engine design, performance. Drawings of the following producers appear in the paper: Humboldt-Deutz, Wisco, C.G.B., Koela updraft, Halbay, Hansa, Imbert, Panhard, Sabatier Fiat, Koela downdraft, Gohin-Poulenc, H.S.G. Brandt, Koela double draft.

New Brush Koela duodraft gas producer
Anonymous
Mech. World Eng. Record 107, 84-5 (1940).
Details of fueling system for road transport now in quantity production, and having several new features, are given.

A new gas producer. The Brush-Koela "duodraft" plant for light commercial vehicles
Anonymous
Automobile Engr. 30, 53 (1940).

Les nouvelles automotrices à gas des forêts de la Société Nationale des Chemins de Fer Français
Martin, H.
Le Génie civil 113, 53-6 (1938).
Mechanical details of Dietrich rail motorcars of Societé Nationale des Chemins de Fer Français equipped with gas producers using charcoal fuel are discussed. The following dimensions are given: Overall length, 22.85 m.; width, 2.87 m.; height, 4.28 m.; max. speed, 120 km. per hr.

O problema do gasogenio
Foa, A.
S. Paulo, Bol. inst. engenharia 31, 80 (1940).
Author advocates construction of engines designed especially for use of producer gas. Ample supply of wood and charcoal are available in Brazil.

Portable gas producers
Irving, F. A.
Brit. Pat. 549,345, June 4, 1941.
A bubbling-type cleaner for gas producer is described.

Portable gas producers for motor vehicles
Clarke-Jones, N.
Ind. Chemist 9, 443-4 (1933).
Portable gas producers for motor vehicles using wood charcoal and low-temp. coke as motor fuel are described. Producer consists of small gas generator gas cleaner and filter and different type engine cylinder head which is substituted for standard head.

Producer gas as an emergency substitute for town's gas
Bedingfield, N. M.
Gas World 117, (1942).
Different types of gas producers that can be used instead of town gas equipment are described. Special reference is made to government "Emergency" 5-therm stationary producer which has been installed in many British factories.

Producer gas as internal combustion engine fuel
Marais, J. K.
J. So. African Inst. Engrs. 37, 74-144 (1938).
A series of experiments on the performance efficiency and power output of engines. The design of and tests on a compressed gas engine. Tables, graphs, photographs and drawings supplement the text.

Producer gas-driven vehicle
Brownlis, D.
Iron Coal Trades Rev. 140, 121-3 (1940).
Brief discussion of recent outstanding developments and review of various equipments now available; producer gas equipment: "Gohin-Poulenc" equipment; Brush-Koela Producer, Hydrogas - Vortex and Rotex producers, "Excess" producer equipment.

Producer gas equipment on tractors in Western Australia
Roberts, R. P.
J. Dept. Agr. W. Australia 15, 391-402 (1938).
Deposits found in the producer gas generator and in the tractor cylinders are analyzed.

Producer gas for motor transport
Allcut, E. A.
Automotive and Aviation Inds. 89, 38-40, 42, 44, 60 (1943); Eng. J. 25, 223-30 (1942).
The requirements of a fuel and the chemistry of the process of producer gas manufacture are discussed. Early and modern mobile producer plants are reviewed; diagrams and graphs included. The problems of fuels, cooling, and cleaning the gas. Operations and installations are discussed.

Producer gas for road traction
Allcut, E. A.
School of Engineering, University of Toronto, Canada, Bull. No. 6, 195-210 (1926).
The suitability of downdraft producers for portable plants of small size was investigated. The experimental gas producer was designed to study: Direction of draft, nature of fuel, diameter of fuel bed, velocity of air supply, and ratio of air to water supply. The results show that the downdraft producer is not satisfactory for portable plants of small size.

Producer gas for small heat treatment furnaces and other processes
Anonymous
The Engineers' Digest, Am. Ed. 1, (11), 626-7 (1944).
The Wellman-Cura 7-1/2 therm producer is a suitable unit to use as a source of gas for heat treatment in place of town gas. The producer is of up-draft type designed in such a way that the gas-collecting hood, interposed between the fuel chamber and the reaction chamber, permits the segregation of finer particles from larger pieces. Water vapor for the reaction is supplied by an automatic pressure type Zenith carburetor. The producer gives very consistent gas quality, 135 B.t.u. per cu. ft. and rarely less than 12% of hydrogen. Test runs were most satisfactory with anthracite, gasworks or coke oven coke sized 1 in. and less, and containing less than 10% ash. The cleaning equipment consisting of slag wool filters gives gas with solid impurities below 0.02 gr./cu. m.

Producer gas plant
Scott, W.
Brit. Pat. 551,210, February 15, 1943; Engineering 156, 420 (1943).
Self-starting on gas by means of fan-starting gas producer, and then after gas is ignitable the engine is started by means of thermostatic device which closes the switch to battery and starter.

Producer gas practice
Stewart, John
Proc. Inst. Automobile Engrs. 15, 813-35 (1920).
A historical development of producer gas manufacture and the analysis of gas produced. Description of the gas producers dating back to 1839. A detailed description of the contemporary double-fire zone type of generator so arranged that each chamber may be operated as a single-chamber apparatus for a short period. Scotch anthracite coal used in experimental work. Comparison of various fuels, av. fuel consumption, and cost per ton-mile are given.

The producer gas road vehicle
Fowke, W. H.
Proc. Inst. Mech. Engrs. 141, (4), 368 (1939); Engineer 167, 449-50 (1939).
The producer gas plant as applied to mobile use is described. The producer plant and engine are discussed in some detail. Experience with a 31-passenger producer gas-operated bus that was driven 32,000 miles and practical operating details are presented.

Producer gas trailers in England
Anonymous
Automotive Inds. 81, 645 (1939).
Low-cost trailer is described; generator and trailer (uncharged) weigh 900 lb. Power output using anthracite or low-temp. coke is 40% less than with gasoline.

La puissance des moteurs alimentés au gaz des forêts
Main, F.
Rev. Int. Bois 4, 118-9 (1937).

Rail car with charcoal gas producer
Kralick, F.
Deut.Motor-Z. 20, 80-82 (1943); The Engineers' Digest 4, 319 (1943).
The article describes a rail car on the Bohemia-Moravia Railways designed and built by the Skoda Works in Pilsen. The engine is 12-cylinder horizontal Skoda of 135 hp.; the gas producer is of the C.P.-Fiser system; has a rectangular cross-section, and there is no lining. The fuel is a dry charcoal so that there is no residue of acids or tar. The producer has a capacity for 200 kg. charcoal, corresponding to 3 hrs. of running. The consumption is 0.5 kg./hp. hr. Diagrams of engine and generator included.

Regulations covering manufacture of producer units
Anonymous
Australian Timber J. 7, 268-77 (1941).

Russian heat recuperating gas producer
Mezine, I.
Gas Oil Power 35, 129 (1940).
New type of gas producer designed to permit recuperation of large part of waste heat involved in producing process.

Scrubber unit for gas generator especially wood-gas generators
Buscher, Hugo (To Imbert Generatoren - Gesellschaft m.b.h.)
Ger. Pat. 716,059, December 11, 1941.

Serienfabrikation von Azetylen Generatoren
Troesch, Max
Schweiz. Bau - Ztg. 118, 15-7 (1941); J. Inst. Engrs. Australia 14, 75-7 (1942).
General Motors Suisse SA have developed and are now building a new acetylene gas producer, GM-Carbor; article describes design and construction of the producer as well as method of installation.

"Solex" gas generators for passenger, truck and stationary engines
Deutsche Vergaser-Gesellschaft Berlin m.b.H.
Automobiltech. Z. 36, 107 (1933).
A general description of Solex-Vergaser for passenger, trucks, and stationary engines.

Solid fuels for motor vehicles
Lierde, F. van
Brennstoff-u. Wärmewirt. 25, (1), 1-5 (1943).
Author describes various commercial types of producers adapted to typical fuels; reactions involved in gas-making; characteristics of such fuels as wood charcoal and anthracite containing less than 10% of volatile matter; auxiliary apparatus such as coolers, purifiers or gas-air mixers. Comparisons of costs show that under present economic conditions (in Germany) producers can be made to operate at a profit provided certain changes in compression, timing, spark adjustment, etc. are made in the motors.

Some experiments on cross-draft gas producer
Woods, M. W.
J. Inst. Engrs. Australia 12, 267-70 (1940).
Reports on investigations into effects of water injection and of variation in length of fire, in cross-draft charcoal gas producer are given; there is optimum length of fire for given rate of gas generation; suggestions are made on design of cross-draft producers; effect of water on gas composition; effect of fire length on gas quality.

Some notes on design of mobile producer gas units
Telford, W. M.
J. Inst. Engrs. Australia 12, 299-304 (1940).
Author discusses requirements of portable units and methods adopted by designers to meet them. Weight-power ratio; calorific value of gas; impurities in gas; gas cooling; fuels; application of mobile producers to gasoline engine.

Soviet gas producers of high capacity
Altschuler, V.
Izvest. Adad. Nauk U.S.S.R., Otdelenye Technicheskikh Nauk 4, 140-2 (1939).
Features of several types of heavy-duty producers developed in U.S.S.R. utilizing pulverized peat, charcoal, buckwheat husks, etc.

The Soviet producer-gas tractors
Anonymous
Gas Oil Power 40, 89-95 (1945).
A review of the evolution of the Stalinez and Kharkov producer gas plants adopted for agricultural machinery in U.S.S.R. Descriptions of the design and operation of various Soviet gas producers such as Nati, Vastan, Tschetiniem, Dakalenko, Vedenski and Autodor are given. All of these gas generators are of downdraft types using mainly wood and charcoal as fuel.

They developed from modification of well-known European producers and finally led to the installations of gas producers fitted to Caterpillar tractors from Stalingrad and Kharkov factories. The main features of these producers are as follows: One charge of fuel is enough for 1-1/2 to 2 hrs. running; air is admitted to the annular nozzle box and then enters the combustion zone through 8 short nozzles each of 12 mm.; the grate is in three parts and can be separated from the combustion chamber base, and it can be withdrawn for cleaning purposes; the fuel charge in the hopper is preheated before working down into the fire zone by the circulation of gas upwards from the grate through an annular space between the hopper and the outer shell; and the gas for the engine is drawn off finally at a much higher level than in the preceding gas-generator models. The Stalinez and Kharkov models differ only in the cleaning and cooling parts.

Stand-by, small-size gas producers
Dieterichs, W., Eaton, F. J., Chamberlain, E.A.C. and Hagley, R. E.
Brit. Pat. 549,021, May 1, 1941.

Substitute fuels for motor vehicles
Lierde, F. van
Tech-wetensch. Tijdschr. 10, 48-56 (1941).
Various types of gas producers are described including auxiliary apparatus such as cooling devices, purifiers and mixtures for gas-air.

Suction-gas generator
Synovec, Rudolf
Ger. Pat. 678,368, July 14, 1939.
Grateless suction gas generator using downdraft. Principle feature is removable firebox.

Suction gas generator particularly for use with wood, and wood charcoal
Witkowitzer Bergbau-und Eisenhütten-Gewerkschaft and Biwank, Karl
Austrian Pat. 145,520, May 11, 1936.

Suction gas producers
Fry, G. F.
Brit. Pat. 557,406, July 15, 1942.
In the air inlet to the producer is placed an easily changed but otherwise invariable choke.

Suction gas producers
John, W. E.
Brit. Pat. 558,825, August 26, 1942.
The gas offtake is vertical on the center line and extends nearly to the bottom where it terminates in a dome-shaped grid. Radial tuyères surround the offtake, the air descending in a jacket around it.

Suction gas producer with annular boiler
Motorenfabrik Deutz A.G.
Ger. Pat. 473,405, December 23, 1924.

The Tulloch-Reading gas producer for motor vehicles
Anonymous
Engineering 127, 641-4 (1929).
A detailed description of Tulloch-Reading gas producer. Application of the producer to motor vehicles and its use in motor vehicles are given.

"Über den Generatorgasbetrieb schwerer Fahrzeuge, insbesondere über den Fahrzeugbetrieb mit einem neuen Generator, der die Verwendung von Braunkohlenbrikette gestattet
Hartner-Seberich, R. and Dehn, K.
Brennstoff-Chem. 15, 204-11 (1934).
Various types of charcoal gas generators for trucks and a new type using briquettes are described.

Updraft gas producers
Telford, W. M.
U.S. Pat. 2,134,492, October 25, 1938.
A gas producer is fitted with a cover flange resting on the rim of the casing and supporting a hopper above and an unlined furnace below. Air injectors are fitted which project through the casing close to the flange. A central gas offtake is provided with a fluid-cooled jacket only on the part that is within the furnace.

The use of domestic motor fuels with special attention to the use of producer gas from wood in a fixed and mobile plant
Berger, Wilhelm
Gas-u. Wasserfach 85, 400-7 (1942).
A description is given of stationary and mobile gas producer plants. The economics of such producers and their maintenance are discussed.

Vehicle gas generators and their fuels. State of development with particular regard to the use of fossil fuels
Hartner-Seberich, R.
Brennstoff Chem. 17, 1-11 (1936); Fuel 16, 15-27 (1937).
Various types in use are described. Modifications necessary for high temp. gasification with bituminous coal are discussed. References.

Vehicle gas producers for tar-free fuels and gas purifiers therefor
Finkbeiner, H.
Z. Ver. deut. Ing. 85, 591-599 (1941).
The Klockner-Humboldt-Deutz, Wisco and Daimler-Benz gas producers, using coke as fuel, and various producer gas purifiers, e.g., van Tongeren, Imbert, and Südgas, are diagrammatically described. Producers using brown-coal briquettes as fuel are only in the experimental stage in Germany. Two recent designs of producers using wood as fuel, viz., Ostmark and Janka, are discussed.

Die Verwendung von festen Brennstoffen als Kraftquelle für Kraftfahrzeuge
Finkbeiner, H.
Automobiltech. 38, 387-92, 414-9 (1935).
Application of solid fuels for automobiles; discussion of charcoal gas generators for various types and their principles of operation; generators of German manufacture illustrated and described.

Der Volvo-Gaserzeuger für Kraftwagen
Lessnig, R.
Feuerungstech. 29, 97-8 (1941).
Author describes the Volvo gas producer built by Swedish automobile factory Volvo, using charcoal. It is built similar to Gohin generator. Report on tests carried out with producer installed on 6,850-kg. motor truck are reported.

Washer for producer gas for motor vehicles
Delvaux, M.
Belg. Pat. 354,151, October 31, 1928.

Welche Zundkerzen sind für Holzgasbetrieb geeignet?
Kühne, G. and Koch, F.
Die Technik in der Landwirtschaft 14, 112-3 (1933).
Various makes of spark plugs were investigated to test their suitability when using producer gas. For best service (starting) electrodes should either extend quite far into the combustion chamber or should be located in as open a space as possible.

Wood gas generator in the wood working industry
List, H. and Franzl, J.
Holz Roh-u. Werkstoff 2, 392 (1939); Abstract in Brennstoff-Chem. 21, 70 (1940).
Description of wood gas generator and purifiers. Water in purifiers contains considerable amounts of acetic acid and phenols. For 70 hp. motor 45 kg./hr. for motoring and 90 kg./hr. full load. Water consumption about 3,000 l./hr. Water content of wood, 7-13%. Gas temp., 150°-160° C. Tar, 0.34 g./Nm.^{3}; acetic acid, .03 g./Nm.^{3} Gas composition: CO_2, 8.7-9; CO, 23.9-24.0; N_2, 51.9-49.3; C_nH_{2n}, 0.6-0.8; H_2, 11.2-11.8; CH_4, 3.0-4.8; O_2, 0.5%; H_o = 1,360-1,550 kcal./Nm.^{3}

Wood gas, how it is made and used to drive vehicles
Donald, C. H.
Wood 4, 80 (1939).
A popular description of wood gas production. The gas passes through series of cooling boxes with baffle plates (for charcoal, cloth filters are used), water vapor condenses on baffles, and dust adheres to surfaces. Temp. at induction pipe is approx. 50° C.

ECONOMICS

Charcoal from British Guiana
Anonymous
Bull. Imp. Inst. 28, 138-46 (1930).
Analyses and technical trials of four native tropical wood charcoals (Yaruru, Soft Wallaba, Ituri Wallaba, and Mora) are considered. They prove to be suitable for use in gas producers adapted to work with charcoal fuel. Relative cost of charcoal and gasoline as motor fuel is listed.

Charcoal from Kenya for power purposes
Anonymous
Bull. Imp. Inst. 29, 437-40 (1931).
Four samples of charcoal examined had been made from: Mixed forest woods, Eucalyptus globulus, Eucalyptus saligna, and Black wattle charcoals produced by burning wood in heaps covered with earth. Chemical analyses of charcoals and results of engine tests carried out with one-ton truck fitted with a portable producer gas plant are listed. Comparative cost of charcoal and gasoline is given.

Coals of low ash content. Producer gas as motor fuel
Bertrand, M. F.
Rev. universelle mines 16, 174-85 (1940).
Importance of ash in gas producers; economic aspects of gasification of coal of low ash content are discussed.

Entwicklung und Stand der Holzgaserzeuger in Österreich, März 1938
Örley, Wolfgang
Automobiltech. Z. 42, 313-6 (1936).
A brief survey of development of German wood gas generators used in Austria up to March 1938 is given. Performance of engines which participated in International Alpine races and those tested in Technical School in Graz is described. Author presents also economic status of gas producers in Austria.

Ersatz gasoline
Anonymous
Business Week, January 9, 1943.
A charcoal-burning producer gas unit known as "gasogenio" was developed in São Paulo, Brazil. In 1942 there were 2,700 cars in Sao Paulo alone operating on producer gas. Five Brazilian states have established commissions for developing an economical working model for the conversion of gasoline motors. They also prepare and grade charcoal. It is estimated that the cost of converting a gasoline engine to gasogenio is $325. A liter of gasoline sells in Brazil for 7-1/2 cents, the price of charcoal is 3 cents a kg. A four-ton truck uses one kg. of charcoal per km., a passenger car uses one-fourth that amount.

Fuels-alternative or supplementary to gasoline - for use in internal combustion engines for road vehicles. Part II - The future possibilities of gas producers and Diesel engines for transport purposes
Metral, A.
J. Inst. Fuel 2, 204-28 (1929).
A survey of petroleum production in the world and economic consideration of substituting petroleum by fuels obtained from hydrogenation and carbonization of coal. Adoption of existing internal combustion engines for gaseous fuels, e.g., acetylene, methane, coal gas or producer gas, from producers using wood or wood charcoal is considered. Methods of gas purification and comparison of engine performance with producer gas and petroleum is given.

Gas producers for motor vehicles and their operation with forest fuels
Great Britain. Imperial Forestry Bureau
Oxford: Imperial Forestry Bureau. Technical Communications No. 1, 1942; Intern. Sugar J. 44, 135 (1942).
Theory of producer gas; the generator; cleaning and cooling apparatus; mixing valve and controls; layout, weight and cost of producers; loss of power and performance; driving and maintenance; charcoal fuels; operating costs; wider aspects.

Les gasogènes - considerations techniques et economiques
Rouyer, Pierre
III° Congresso Internazionale del Carbonio Carburante, 5th Session, Economics, Statistics and Legislature, Rome, September 1937, pp. 13-25.
Historic summary of the evolution of gas generators in France; important improvements realized. A new engine not yet officially tested represents the latest achievment in generator technique. The lack of official tests prevents the author from furnishing ampler details. Comparative operational cost of producer gas-driven vehicles and oil-driven vehicles is given. Also the cost of obtaining producer gas from various sources as wood, charcoal, coke, etc. is estimated. Every nation lacking oil resources should take the necessary steps to ensure wider use of producer gas for vehicles.

La gassificazione dei combustibili nazionali carbonacei in alcune delicate applicazioni di riscaldamento industriale
Magheri, A. G.
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 11-14.
Author discusses cost of using producer gas in internal combustion engines and compares the cost of gas with that of gasoline.

Les gazogènes
Rouyer, Pierre
J. soc. ing. automobile 12, 401-14 (1939).
Gas producers and operating principles are discussed on basis of detailed sketches. Illustrated description of types and economic features are given.

Das Holz als Kraftstoff
German Forestry Association
Mitteilungen des Ausschusses für Technik in der Forstwirtschaft; Heft No.5, 171-234 (1933).
History, economics, theory and practice of wood and charcoal producer gas in Germany; most important types of wood-gas generators: Imbert, Deutz, Oberberbach, and "Obogen". Practical experiences with these generators. A brief survey of wood-gas production in countries outside of Germany.

Management and running costs of trucks propelled by producer gas from producers using anthracite as fuel
Lessnig, R.
Feuerungstech. 29, 87-91 (1941).

Motor fuel economy of Europe
Egloff, Gustav
Ind. Eng. Chem. 30, 1091-1104 (1938).
About 9,000 gas-driven vehicles in Europe manufacture their own combustible gas from wood and charcoal consuming about 450,000,000 lb. of wood yearly. The economic aspect of gas-driven vehicles is surveyed.

The present status of charcoal gas motor cars
Anonymous
J. Fuel Soc. Japan 19, 58 (1940).
Nineteen concerns make gas producer units; will be combined into one unit. As many as 20,000 small-size cars are operating with gas producers.

Producer gas in India
Anonymous
Foreign Commerce Weekly 8, (11), 22 (1942).
India is developing producer gas plant production. Material for 5,000 plants has been made available for the second quarter of 1942. Although supplies of suitable charcoal are limited, the Punjab Government has decided to encourage conversion of vehicles to producer gas operation in view of its inability to guarantee the gasoline supply.

Producer gas in Jamaica
Anonymous
Foreign Commerce Weekly 8, (11, 22 (1942).
A few experiments have been made using substitute fuels for motor vehicles in Jamaica. Producer gas generated from charcoal and power alcohol distilled from sugarcane juice as a substitute for gasoline have been considered.

Producer gas is practicable
Sheffield, F. C.
Bus and Coach 13, 130-3, 147 (1941).
Article explains how Eastern National Omnibus Co. has converted their modern fleet to operate exclusively on home-produced fuel.

Producer-gas vehicles
Anonymous
Engineering 153, 133 (1942).
It is reported that Messrs. Thomas Tilling, Ltd. have for many months been operating several producer gas vehicles. This procedure has enabled a true comparison to be made between the total cost of operation of producer gas, gasoline, and Diesel vehicles. The present position is that operating with anthracite at 85 shillings a ton, fuel costs with producer gas are lower than with either gasoline or Diesel oil. Total costs, which include such matters as refueling and attention to the fuel hopper and filter, are higher than with Diesel oil, but are lower than with gasoline. A distance of over 1,000,000 miles has already been covered on producer gas, representing a saving of approx. 100,000 gal. of imported liquid fuel. There has been some loss of power in buses converted to producer gas, but no difficulty has been experienced in maintaining ordinary running schedules with them. One of the major difficulties experienced at the outset of the conversion work was in connection with the gas filter.

Producer gas vehicles
Woods, M. W.
J. Inst. Engrs. Australia 10, 89-96 (1938).
The article deals with recent developments in France and England in the application of producer gas plants to motor vehicles. A number of typical plants are described and the performance and economy of producer gas vehicles are examined. The producers described are: Gohin-Poulenc, Sabatier, Franco-Belge, Panhard, High-Speed gas producer, Wishart, Berliet, and Brandt.

16,000 gas producer vehicles in traffic
Nabuco de Araujo, C. E. Jr.
Chem. Eng. News 22, 1126 (1944).

Solid fuels for motor vehicles
Lierde, F. van
Brennstoff-u. Warmewirt. 25, (1), 1-5 (1943).
Various commercial types of producers adapted to typical fuels are described. Reactions involved in gas making; characteristics of such fuels as wood charcoal and anthracite containing less than 10% of volatile matter; auxiliary apparatus such as coolers, purifiers or gas-air mixers are discussed. Comparisons of costs show that under present economic conditions (in Germany) producers can be made to operate at a profit provided certain changes in compression, timing, spark adjustment, etc. are made in the motors.

Sweden 60,312 producer gas vehicles
Anonymous
Oelu. Kohle, 37, 570 (1941).

The use of domestic motor fuels with special attention to the use of producer gas from wood in a fixed and mobile plant
Berger, Wilhelm
Gas-u. Wasserfach 85, 400-7 (1942).
A description of stationary and mobile gas producer plants as well as the economics of such producers and their maintenance are discussed.

The use of substitute motor fuels on the continent
Landsberg, W.
Engineering 153, 114-5 (1942). Abstract in J. Inst. Automobile Engrs. 10, (9), X, (1942).
Three fuels are in use: Producer gas, highly compressed gases, and liquified gas. Their availability and weaknesses are briefly mentioned. 150,000 producer gas trucks were on the roads of greater Germany in autumn of 1941. Many canal and river vessels are being converted to producer gas use as well as Diesel locomotives. Figures for Sweden, Holland, France, Italy, and Belgium are given which show the use of substitute fuels.

Vergasung von Anthrazit und Steinkohlenkoksen im Fahrzeuggaserzeuger
Lang, K.
Z. Ver. deut. Ing. 83, 472-3 (1939).
Results of experiments with small gas producers using anthracite and low- and high-temp. cokes are given. Changes of calorific value with different fuels per run of 100 min., variations in heating value with degree of saturation and influence of grain, size, and porosity on the reaction are illustrated by graphs. The cost of fuel is discussed.

ENGINE TEST

Agricultural tractors using producer gas
Lutz, Hans
Z. Ver deut. Ing. 86, 359 (1942).

Alcohol and charcoal producer gas for automobile engines
Richihei, Miki
Power World Eng. Congr. Tokyo 1929, 28, 243 (1931).
Author shows by diagrams that high-compression ratios are favorable for producer gas engines.

Alternate motor fuels
Clarke-Jones, N.
Automotive and Aviation Inds. 87, 40 (1941).
Main fuel for portable gas plants are anthracite and low-temp. coke. Twelve lb. of solid fuel is equal to 1 gal. of gasoline. Without increased compression, supercharging or spark advance change, the power loss is 40%; with certain modifications it can be reduced to 15-20%. The performance of engine using compressed gas, gas in bags, and sewage gas are discussed.

The application of producer gas to motor vehicles
Rennie, E.J.C.
J. Inst. Engrs. Australia 2, 101-9 (1930).
The paper deals mainly with technical considerations in connection with the application of producer gas to motor vehicles. Results of bench and road tests are given. It is concluded that the producer gas vehicle is practical where the work consists mainly of long runs and where charcoal is cheap and gasoline costly. Numerous graphs, tables and photographs supplement the paper.

Automobile gas producers
Bailly, R.
Rev. universelle mines 17, 6-11 (1941).
A detailed discussion of working conditions for automobile producers using coal is given. Only a slight addition of H_2O to the air supply is desirable; much H_2O promotes CO_2 formation. A suitable gas contains 31% CO and 69% N_2. The coal should contain not more than 2% ash. The output of the motor is 30% less than with gasoline.

Automotive gas generators used in the U.S.S.R.
Dimitryev, A. P.
Automotive Ind. 83, 534-5, 551 (1940).
Soviet Union uses a great number of trucks and tractors equipped with gas generators and plans have been made to run 40,000 more trucks on producer gas. Some details of design and operation of gas producers are given.

Bench and field tests of vehicle gas producer plant as applied to farm tractors
Bowden, A. T., Freeth, E. N. and Rutherford, A. D.
Proc. Inst. Mech. Engrs. (London) 146, 193-207 (1942).
Over 700 tractors working on producer gas are being used successfully in Western Australia. Detailed results are given on the performance and data such as fuel consumption and power output; comparison of power output using high- and low-compression pistons, performance on gas compared with that obtainable when using kerosene under comparable working conditions, cylinder wear and others were obtained.

Bericht über die Versuchsfahrt mit heimischen Treibstoffen 1935
Schulz, E.
Ver. deut. Ing. 74 Hauptversammlung, 287-97, Darmstadt 1936.
Road test data for 46 trucks, 40 of which are equipped with gas generators, are given. Discussion is mostly economic. Wood, charcoal, hard coal, anthracite, various kinds of coke and briquettes are suitable fuels. Two classes of fuels are recognized, one tar-forming, the other non-tar-forming. Two types of generators should be built. One should be able to use any of the various tar-forming fuels while the other must be able to burn all non-tar-forming fuels such as charcoal. So far gas generators have been limited in general to a particular fuel. Steps should be taken to insure adequate supply of fuel.

Charcoal gas producer tests
Bainbridge, J. R.
Modern Engr. 15, (1), 22 (1941), Coke 3, 216 (1941).
Road tests were conducted using A.E. (Australian Emergency) gas producer, forest red gum charcoal serving as fuel. The generator could be operated for 650 miles without cleaning. The av. cost of charcoal per mile was 0.68 d.

Conditions for the preparation of hydrogen-rich gases in motor vehicle gas producers
Gwosdz, J.
Automobiltech. Z. 44, 447 (1941).
High H_2 content will insure combustion in high-speed engines. Gases rich in H_2 are formed when fuels rich in H_2 are gasified in downdraft generators.

The conversion of compression ignition engines to producer gas operation
Michalski, W. and Spiers, J.
J. Inst. Automobile Engrs.; Automobile Research Committee, Confidential Bull. No. 1944/3, 1944, 35 pp.; Engineering 158, 98, 118, 138, 158, 198 (1944).
No major alterations required to the engine structure to convert it to producer gas operation, the only additions being a suitable form of injection pump control linked to a gas/air mixer and a new induction manifold. Bench and road tests performed.

De Dakar à bangui en véhicule à gazogene
Anonymous
Rev. Intern. Prod. Col. 5, 101-3 (1930).

Diesel and gas engines for tractors
Anonymous
Gas Oil Power 40, 167-169 (1945).
The Hanomag 5.2 l. four-cylinder tractor Diesel engine was re-designed for producer gas use. Test runs showed that change in fuel resulted in a decrease in output from 40 B.H.P. to 32 B.H.P. at 1,200 r.p.m., i.e., by 20%; at 800 r.p.m. the decrease amounted to 22%. To keep the output to the full Diesel value without making essential changes in Diesel design or increasing the speed, the cylinder bore was increased from 105 to 110 mm. This step increased the piston-swept volume from 5.2 to 5.71. A compression ratio of 13-1/2 to 1 was found to be safe in this respect. This application of increased bore and increased compression ratio to the Diesel model has raised its output to 46 B.H.P. at 1,200 r.p.m. when running on producer gas with the use of hard wood fuel of 10% moisture content.

The effect of compression ratio on the performance of a petrol engine converted to producer gas
Spiers, J. and Giffen, E.
J. Inst. Automobile Engrs. 11, 17 (1942).
The tests show that with producer gas of av. quality increased power output is obtained with increases in compression ratio up to a limit of 13.9:1 determined by the onset of detonation. The improvement in power output is greater with gas of high calorific value than with low quality gas. In an engine specially designed and built to operate only on producer gas, compression ratios between 12:1 and 14:1 could usefully be employed. For the conversion of heavy-duty gasoline engines of the type used in the present test, ratios between 8:1 and 10:1 appear to be most suitable.

Einfluss des Verdichtungsverhältnisses und des Gasheizwertes auf Leistung und Verbrauch einer Gasmachine
Schnürle, Adolf
Ver. deut. Ing. 74 Hauptversammlung 249-52, Darmstadt 1936.
Experiments were conducted with a single cylinder engine 16 x 24", 215 r.p.m. at compression ratios (C.R.) 4,5,7, and 10:1. Optimum spark advance at min. b.s.f.c.* and max. output decreased with C.R. from 42° to 25° b.t.c.** Both thermal efficiencies and output were higher at the high C.R. Combustion pressures continue to increase with spark advance. For C.R. higher than 7:1 major design changes are recommended. Higher heating values and higher H_2 content require less spark advance for max. power. At the same spark advance, higher H_2 content will increase combustion temp. and pressure causing roughness and possible pre-ignition.

*Brake specific fuel consumption.
**Before top dead center.

L'emploi du"gaz des forêts"comme carburant de remplacement
Coupan, Gaston
Génie civil 113, 421-7, 448-51 (1938).
Review is given of French developments in use of producer gas for motor trucks and tractors. Progress in producer gas technology is stressed.

Entwicklung der Fahrzeuggaserzeuger in Schweden
Gumz, W.
Feuerungstech. 29, 93-7 (1941).
The development of automotive gas producers in Sweden is traced. A report on a contest sponsored by Swedish Automobile Club for cars and trucks equipped with various types of wood and charcoal gas producers is discussed; technical data on cars and producers, and results of tests are given.

Entwicklung und Stand der Holzgaserzeuger in Österreich, März 1938
Örley, Wolfgang
Automobiltech. Z. 42, 313-6 (1939).
A brief survey of development of German wood-gas generators used in Austria up to March 1938 is given. Performance of engines which participated in International Alpine races and those tested in Technical School in Graz is described. Author presents also economic status of gas producers in Austria.

Erfahrungen im Betrieb mit festen Brennstoffen in kleineren Motorfahrzeugen, namentlich für die Kleinlandwirtschaft
Meuth, H.
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 43-51.
Practical tests made with small cars and trucks have proved that even in Alpine countries the efficiency of substitute solid fuels is very good. Particularly suited for the purpose are, besides wood and charcoal, the coke of pit-coal and turf. These fuels can also be successfully used in small agricultural tractors.

Experiments on a high-speed producer gas engine
Burstall, A. F. and Woods, M. W.
Engineer 167, 640-2 (1939).
The max. power available is 66% of that obtained from gasoline while the thermal efficiency is the same. Mixture strength must be precisely adjusted.

Experiments on the behavior of various fuels in a high-speed internal combustion engine
Burstall, A. F.
Proc. Inst. Automobile Engrs. 22, 358 (1928).

Experiments on the combustion of carbon monoxide air mixtures in a high-speed engine
Burstall, A. F.
Proc. Inst. Automobile Engrs. 21, 628 (1927).

Experiments on the power and efficiency of the high-speed gas engine
Burstall, A. F.
Proc. Inst. Automobile Engrs. 19, 620 (1925).

Fahrzgeug Gaserzeuger und Motor
Mehlig, H.
Z. Ver. deut. Ing. 80, 301-5 (1936).
Theoretical and experimental studies of gas producers and engines using gaseous fuels.

Fahrzeugmotorenbetrieb mit Karburiertem Holzkohlengenerotorgas
Wawrziniok, Erwin
Automobiltech. Z. 36, 546-9 (1933).
The introduction of alcohol improved the efficiency of an automobile gas producer operated with charcoal. Diagrams showing the performance of the motor are given.

Feuerungstechnik an Schiffsgasanlagen
Schmidt, Kurt
Feuerungstech. 29, 91-3 (1941).
Advantages and economy of gas producers for marine engines; producer charging; oil-water emulsion cleaning process; double gas producer for briquette firing; experiences with gas producers installed on inland waterway tugboats.

Fuel gas. Vehicles for compressed gas
Larivière, P.
Chaleur et ind. 20, 467 (1939).
Engine test data are given.

Fuels-alternative or supplementary to petrol - for use in internal combustion engines for road vehicles. Part II - The future possibilities of gas producers and Diesel engines for transport purposes
Metral, A.
J. Inst. Fuel 2, 204-28 (1929).
A survey of petroleum production in the world and economic considerations of substituting petroleum by fuels obtained from hydrogenation and carbonization of coal. Adoption of existing internal combustion engines for gaseous fuels, e.g., acetylene, methane, coal gas or producer gas, from producers using wood or wood charcoal is considered. Methods of gas purification and comparison of engine performance with producer gas and petroleum is given.

Gas as a /motor/ fuel
Clarke, J. S.
Automobile Engr. 30, 8 (1940).
An experimental spark-ignition engine run on city gas at 15:1 compression ratio compared favorably with Diesel engines in economy and power developed.

Gas mixer for converted compression-ignition engines
Anonymous
Engineering 158, 247 (1944).
Bench and service tests have been carried out on an extensive scale to determine whether spark-ignition engines, normally consuming gasoline, and compression-ignition engines consuming heavy oil, could be converted to run satisfactorily on producer gas. The normal fuel-injection equipment included a special mixing valve for introducing air and gas in suitable proportions under all conditions of load and speed. It is a disc valve which can easily be turned in a lathe and requires no fine limits or specially accurate fitting.

Gas producer for motor vehicles
Anonymous
Iron and Coal Trades Rev. 140, 40 (1940).
Design features operation of Brush-Koela duodraft equipment; actual experience with one-ton vehicle demonstrated that with expenditure of 3 pounds sterling on fuel, mileage obtained was equal to that given by 180 gal. of gasoline, cost of which would be about 16 pounds sterling.

Gas producer motor vehicles
Anonymous
Passenger Transport J. 83, 138 (1940).
Problems connected with application of gas producers to freight and public service vehicles; application of gas producer plant, such as training of drivers, types of gas filters and reduction of cylinder wear, suitable fuels, use of producers with compression-ignition engines, compression ratios, etc. discussed before conference at London organized by government producer Plant Licenses Assn.

Gas producers as applied to transport purposes
Lowe, Robert
J. Junior Insts. Engrs. 50, 231-53 (1940).
Principles of operation of portable gas generators are discussed as well as requirements for transport purposes, types of producers, purification of gases, modification to engines, etc.

Gas producers for motor vehicles and their operation with forest fuels
Great Britain. Imperial Forestry Bureau
Oxford: Imperial Forestry Bureau. Technical Communications No. 1, 1942; Intern. Sugar J. 44, 135 (1942).
Theory of producer gas; the generator; cleaning and cooling apparatus; mixing valve and controls; layout, weight and cost of producers; loss of power and performance; driving and maintenance, charcoal fuel; operating costs; wider aspects.

Gaskraftanlangen für heimische feste Kraftstoffe
Schmidt, Kurt
Motor und Kraftstoff. Ver. deut. Ing. Verlag G.m.b.H., pp. 15-17, Berlin 1939. Wissenschaftliche Herbsttagung 1938 des Ver. deut. Ing. in Augsburg.
A gas generator installation on a small harbor vessel (250 hp.) is described. Purification is greatly facilitated through ample water supply. In spite of the fact that engine demand varied from 30 to 100%, gas generator operation was satisfactory.

Gasogens
Miller, R.H.P.
Madison, Wisconsin, U.S. Dept. Agr. Forest Prod. Lab. 1944, 5 pp. (Mimeo. No. R1463).
After a brief statistical summary, purpose of investigation is explained. Almost any type of solid fuel such as nut shells, coke, wood, etc. can be used; however, a good grade of charcoal is best for reasons explained. Construction, as well as principles of gas generators and operation, are described and precautions are emphasized. Without modification the engine will deliver only about 50% of the power running with producer gas than when running with gasoline. This may partially be overcome through increase of C.R. Results of road tests using charcoal and sawdust are shown.

Les gazogènes
Lepoivre, A.
La Nature 1941, (6), 73-9.
Gas producers; history of development; design and operation; gas cooling and purification; conditions to be fulfilled in installation of producer with special reference to automotive producers.

German trucks run by wood-gas generators
Anonymous
Foreign Commerce Weekly 10, (4), 25 (1943).
150,000 or more vehicles are equipped with gas generators. Firebox with double wall is lined with refractory materials. Exhaust heat is utilized to dry charge. Removal of tar and dust presents a difficult problem.

Government emergency type gas producer
Anonymous
Gas World 114, 111 (1941).
Notes on operation and maintenance of British emergency producer described in Report of Committee on Emergency Conversion of motor vehicles to producer gas; diagrammatic illustrations are given.

Greater use of producers in motor transport in Brazil
Anonymous
Oel u. Kohle 37, 568 (1941).

Das Holz als Kraftstoff
German Forestry Association
Mitteilungen des Ausschusses für Technik in der Forstwirtschaft; Heft No. 5, 171-234 (1933).
History, economics, theory and practice of wood and charcoal producer gas in Germany; most important types of wood-gas generators: Imbert, Deutz, Oberberbach, and "Abogen". Practical experiences with these generators. A brief survey of wood-gas production in countries outside of Germany.

Holzgas und Motorschmierung
Kühne, G. and Koch, F.
Die Technik in der Landwirtschaft 14, 91 (1933).
No significant changes were found after 200 hrs. of operation. Since no crankcase dilution takes place, it should be possible to use oil over longer periods of time.

Der Holzgaskraftwagen im praktischen Fahrbetrieb
Meuth, H.
Die Technik in der Landwirtschaft 13, 253-4 (1932).
Road tests are described using an Imbert generator on a five-ton truck. Sixteen lb. of wood were found to equal 1 gal. of gasoline. After about 12,000 km. savings due to difference in fuel cost will pay for the cost of reconversion. Precautions in handling gas producers are briefly discussed.

How are gas producers tested?
Malschaert
Brennstoff-u. Wärmewirt 25, (2), 25-9 (1943).
A review giving details of motor vehicle producers; experimental conditions for block and road tests; measuring devices for gas, tar, dust, ash; calorimeters; factors to be measured such as acceleration or starting time. Weight and space considerations must be taken into account in comparing costs and conveniences of liquid fuels and producer gas for trucks.

An investigation of the high-speed producer gas engine
Woods, M. W.
Engineer 169, 448, 468 (1940).
A continuation of the investigation reported in the May 26, 1939 issue of the Engineer. The subjects investigated are: The heat content of the gas-air mixture; the effect of mixture strength on power and efficiency; the effect of compression ratio on power and efficiency; ignition advance and the speed of combustion; and the torque-speed relation.

Der Leistungsabfall gasgetriebener Fahrzeugmotoren und die Wege zu seiner Verminderung
Rixmann, W.
Z. Ver deut. Ing. 81, 1357-63 (1937).
Drop in output of automotive engines driven by gas and means for improvement of situation is discussed as well as results of experiments made on various gas mixtures and gas-air mixers.

Leuchtgasbetrieb von Fahrzeug Motoren
Rixmann, W.
Z. Ver. deut. Ing. 80, 627-32 (1936).
Results of operation of motor vehicle engines with illuminating gas are reported.

Loss of power in petrol engines running on producer gas
Heywood, H.
Engineering 151, 61-3 (1941).
The low relative power output from use of the gaseous fuel is due to its low charge, the calorific value of the gas-air mixture being only two-thirds that of gasoline-air. By supercharging up to 12 in. Hg pressure, the power output can be raised to equal that of gasoline.

Gas producers for motor vehicles and their operation with forest fuels. Loss of power with producer gas, specially designed vehicles and performance.
Kissin, I.
Oxford: Imperial Forestry Bureau, Tech. Commun. No. 1, 1942.
The loss of power changes from 35% to 6% when compression ratios increase from 4:1 to 8:1. Fuels used in producer tests were: Charcoal, low-temp. coke, and anthracite. Best acceleration and hill-climbing ability was obtained with charcoal, whereas highest mileage with anthracite. Fuel consumption per ton-mile is given.

Marine gas producer installations
Petrov, J. P.
Sudostroenie 7, 329 (1940).
Description and results of tests of producer installations using wood logs as fuel developed by Soviet Research Institute.

Mixtures of producer gas petrol
Kennedy, W. B.
J. Inst. Engrs. Australia 12, 259-63 (1940).
Detailed report is given on experiments made to determine increase in power output of high-speed producer gas engine when gasoline is mixed with producer gas; on the effect of mixture strength on power output; and on the analysis of results. Conclusion is reached that the addition of gasoline to producer gas provides a method of obtaining increased power from an engine running on producer gas. Bibliography.

Mobile gas producer test plant
Verman, L. C.
J. Sci. and Ind. Research (India) 2, 259-70 (1944).
The design of a test plant for examining the performances of mobile gas producers is described and illustrated and results are given for 37 producers tested. The test plant is built around a 29.4 hp, Chevrolet motor that can be used either as a pos.-displacement-type pump or as a prime mover. The producer gases are tested for dust content, composition of CO, CO_2, O, H_2O, SO_2, NH_3, and for calorific value.

The modern portable gas producer
Goldman, B. and Clarke-Jones, N.
J. Inst. Fuel 12, 103-40 (1939); Engineer 166, 712, 740 (1938).
A comprehensive survey of the gas producer field. Many aspects of the subject are considered; past developments; theory; producer-gas plants; design of generators; gas purification; fuels; gas produced; fuel consumption; engine design; performance. Drawings of the following producers appear in the paper: Humboldt-Deutz, Wisco; C.G.B.; Koela up-draft Malbay; Hansa; Imbert; Panhard; Sabatier Fiat; Koela down-draft Gohin-Poulenc; H.S.G. Brandt; Koela double-draft.

Note sperimentali sul gassogeno "Excelsior" a combustione centrale sferica
Romana Gassogeni Soc.
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 15-16.
Some details on the performance of the gas generator "Excelsior" are presented.

The performance of a converted petrol engine on producer gas
Spiers, J.
J. Inst. Automobile Engrs. 10, 105 (1942).
A comprehensive investigation of the performance of a gasoline engine operating on producer gas and of methods of restoring the power loss resulting from the use of such a fuel is described. A British Emergency gas producer was used to generate gas for the tests.

The performance of a converted petrol engine with different producer fuels
Spiers, J. and Giffen, E.
J. Inst. Automobile Engrs. 11, 155-94 (1943).
Six different fuels have been used in a government emergency gas producer to conduct the tests, namely: Anthracite activated anthracite, low-temp. coke, high-temp. coke, activated high-temp. coke, and charcoal. The rate of fuel consumption (lb. per hr.) was very similar with all fuels at the same engine speed except charcoal which gave higher rates. Cylinder wear was not excessive with any of the fuels. Numerous graphs and tables accompany the paper.

Power output of combustion motors operated with producer gas
Ferretti, P.
Metano carbonio carburante 5, 107-11 (1943).
A comparison is given of the power output of engines operated with producer gas and with liquid fuels. Various possibilities of producer-gas operation are discussed, such as agricultural tractors and ship propulsion.

Producer gas as a substitute for gasoline
Noel-Jordan, J. W.
The Engineers' Digest, Am. Ed. 1, (1), 34-5 (1943).
A brief description of a typical gas producer plant which can be used instead of gasoline in case of emergency. When running on producer gas, the power output of the motor is reduced to approx. 60% of the total power developed by the same engine using gasoline.

Producer gas as internal combustion engine fuel
Marais, J. K.
J. So. African Inst. Engrs. 37, 74-144 (1938).
A series of experiments on the performance efficiency and power output of engines. The design of and tests on a compressed gas engine. Tables, graphs, photographs and drawings supplement the text.

Producer gas; effect of compression ratio on performance
Anonymous
Automobile Engr. 32, 523 (1942).
Engine with compression ratio 4.7:1 showed a loss of 50% power when producer gas was used. Little gain was obtained above 10:1 and max. power output amounted to about 70% of gasoline.

Producer gas for commercial vehicles
Reed, B.
Ry. Gaz. 71, (20), (24), 641-2, 774-5 (1939).
Description of producer gas plants and their use in Great Britain is given. Included are also traffic regulations and account of taxation.

Producer gas for internal combustion engines
Tromp, F. J.
J. So. African Inst. Engrs. 39, 274-86 (1941).

Producer gas for motor vehicles
Smith, D. J.
Proc. Inst. Automobile Engrs. 14, 169-239 (1920); Engineering 109, 59-64, 92-5 (1920).
A small suction-producer used on three- and five-ton trucks is described. Time required to start from cold is 15-20 min. Other disadvantages are the weight of the plant, 4.5-6.0 lb. per hp., the necessity for an occasional cleaning, and an increase of 75% in the weight of fuel including water. Coke, charcoal, and compressed dried peat were successfully used in place of anthracite. The greatest advantage is the low fuel cost which is 0.091 d. per net ton mile as against 1.2 d. for gasoline at the prices of fuel in England.

Producer gas for road vehicles
Anonymous
Engineer 163, 682-4 (1937).
Account of demonstration in London to show that ordinary motor vehicles can be run on solid fuel. Gas producer system has been applied to six-cylinder engine developing 60 B.H.P. at 2,400 r.p.m. on gas. Engine can run within 3 min. of starting of producer.

Producer gas tests in Queensland Railway Department
Renton, C.
J. Inst. Engrs. Australia 12, 274-8 (1940).
A description is presented of cross-draft producer gas plant of French origin using charcoal as fuel. The plant is mounted on a 45-hp. rail car fitted with A.E.C. gasoline engine. Tables include test data and relative cost of gasoline and producer gas.

Producer gas in Sweden
Anonymous
Refiner Natural Gasoline Mfr. 20, (4), 152 (1941).
Producer gas, made directly from either charcoal or wood, is rapidly substituting gasoline as fuel for the motor vehicle traffic in Sweden. The wood fuel costs about 26% less than gasoline. 35,000 motor vehicles, mostly trucks, have been equipped for use of producer gas as fuel. The equipment consists in the main of a retort, placed on a trailer behind the vehicle. The retort has a lid on top for refueling which is kept tight. There is a slow draft allowed from the bottom, and the gas and smoke in the retort is sucked into the engine by way of a tube. The only change to the engine equipment is a new or altered carburator. A test made with six-cylinder two-door car showed that for 1,161 miles, fuel consumption was 24-3/4 hectoliter charcoal; hectoliter = 22 gal.

Producer gas in Sweden
Anonymous
Foreign Commerce Weekly 8, (11), 22 (1942).
Lengthy tests have been conducted in Sweden with 38 types of producer gas plants in 127 vehicles. Of the various types, 22 used wood and 16 wood charcoal. The downdraft class of producer gas gave best results with wood fuels, the cross-shaft type was best with charcoal.

Producer gas is the motor fuel of Finland
Branders, H. A.
Automotive Ind. 84, 482-5, 522-3 (1941).
The composition of good gas produced from charcoal is CO,30%; CO_2,2%; H,10%; hydrocarbons,0-2% and N,56%. The values for wood gas are 20, 11, 17, 2, and 50% respectively. By supercharging to 6 lb./sq. in. the power loss can be totally compensated. A displacement type rotary blower was found to be most suitable.

Producer gas motor vehicles
Egloff, G. and Van Arsdell, P.
Presented Before Am. Chem. Soc. Pittsburgh, September 6, 1943; Abstract in Petroleum Refiner 22, (9), 140 (1943).
This review discusses briefly the general types of gas producer in use. The British Emergency Producer is considered in some detail. A number of tables accompany the review, one of which gives the figures on the use of gas producers throughout the world. The total is 814,706 with the U.S.A. reported using six. The available fuels for gasogenes are wood, coal, peat, and miscellaneous. Twenty-eight different kinds of fuels listed.

Producer gas operations and the K.A.K. producer gas trials
Cassler, H.
Tek. Tid. 71, Uppl. D, 17 (1941); Abstr. in J. Inst. Automobile Engrs. 10, (9), XII, (1942).
An account is given of the road trials for producer gas vehicles carried out by the Swedish Automobile Club in September 1940. The gasification process in up-, down-, and cross-draft producers is discussed. Thirty-eight types of producer plants were used in the trials of 127 vehicles, ranging from 10 hp. cars to heavy commercial vehicles.

Producer gas operation in winter
Cassler, H.
Tek. Tid. 73, (18), 25 (1943); Abstr. in J. Inst. Automobile Engrs. 12, (8), XVI, (1944).
The article gives a report of a producer gas trial organized by the Swedish Royal Automobile Club in February 1942. The types of producer plants used by the 116 starters included 24 different types designed for charcoal and 20 types for wood fuel, with various cold-weather devices, which are described.

The producer gas road vehicle
Fowke, W. H.
Proc. Inst. Mech. Engrs. 141, (4), 368 (1939); Engineer 167, 449-50 (1939).
An article on the producer gas plant as applied to mobile use. The producer plant and engine are discussed in some detail. The author reports experiences with a 31-passenger producer gas operated bus that was driven 32,000 miles. Practical operating details are presented.

Promising producer-gas tests with compression ignition
Anonymous
Comm. Motor 74, 260 (1941).
The Cement Marketing Co. Ltd. carried experiments based on pilot injection of oil fuel using dynamometer and a truck for trials on the road. Firing the gas by injecting a small quantity of liquid fuel proved reliable and satisfactory. A gas mixer which does not restrict cylinder filling proved by far the best apparatus. Better consumption might be obtained if smaller-diameter injection-pump elements were used. The max. output developed on gas, liquid-fired was 46.6 B.H.P. at 1,600 r.p.m. Bench consumption tests gave 2.43 pints per hr. when running at 1,210 r.p.m. with a 42-lb. brake load.

Producer gas vehicles
Woods, M. W.
J. Inst. Engrs. Australia 10, 89-96 (1938).
The article deals with recent developments in France and England in the application of producer gas plants to motor vehicles. A number of typical plants are described and the performance and economy of producer gas vehicles are examined. The producers described are: Gohin-Poulenc, Sabatier, Franco-Belge, Panhard, High-Speed gas producer, Wishart, Berliet, and Brandt.

Relation between calorific value and road performance of producer gas vehicles
Webster, H., Bairstow, S., and Macfarlane, W. A.
J. Inst. Fuel 15, 93-100 (1942).
Tests on Dennis truck with magneto-ignition showed that road performance decreased linearly with calorific value down to 90 B.t.u./cu. ft. Anthracite and low-temp. coke of volatile content V = 12% (dry basis) had best road performance followed by wood charcoal and medium temp. cokes having V = 4-4.5%.

Ricerche sul funzionamento dei motori a carburazione con alimentazione a gas di carbone di legna
Tessari, Igino
III° Congresso Internazionale del carbonio carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 53-71.
The report contains the results of the test performed with a four-cylinder Fiat Balilla motor for motor cars, and one-cylinder motor with variable ratio of compression; both motors used charcoal gas.

Solid fuel for motor transport
Foxwell, G. E.
Engineering 146, 299-300 (1938).
Experience shows that producer gas vehicles are as reliable and as simple to operate as gasoline bus, truck, or private car. Producer and cleaning plant weigh relatively little and can be arranged inconspicuously. The most suitable fuels are certain anthracites, charcoal, or low-temp. coke.

Some experiments on cross-draft gas producer
Woods, M. W.
J. Inst. Engrs. Australia 12, 267-70 (1940).
Reports on investigations into effects of water injection and of variation in length of fire in cross-draft charcoal gas producer are given; there is optimum length of fire for given rate of gas generation; suggestions are made on design of cross-draft producers; effect of water on gas composition; effect of fire length on gas quality.

Solid fuels for transport gas producers
Fitton, A.
Coke 3, 68-70 (1941).
Road tests conducted by the Fuel Research Board to evaluate some fuels, such as anthracite, low-temp. coke, etc., for transport purposes are outlined.

Some researches on the use of producer gas for motor vehicles
Marais, J. K.
J. So. African Inst. Engrs. 34, 134-73 (1936).
Three separate types of tests on gas producers are described: Artificial load test, bench test, and road or actual working test. Complete set of data is given for all three types of tests.

Stadtgasbetrieb mit Omnibussen der Berliner Verkehrsbetriebe
Holbein, O.
Automobiltech. Z. 42, 65-9 (1939).
Description of operation of motor buses in Berlin with city gas. Data given show the relationship between design and road performance.

Straw is used as a fuel in gas producers
Anonymous
Ind. Eng. Chem. News Ed. 17, 212 (1939).
The tests were made in U.S.S.R. with straw as fuel for gas producers. Straw has the same content of C and H as wood and was found to work particularly well in producers with reversed burning. Moisture content should be less than 15%. The av. consumption of straw is about 3 kg./kw-hr.

Substitutes for gasoline in France
Kalmanovsky, E.
Petroleum (London) 5, 203-4 (1942).
Peat containing 30-40% of moisture and 20-25% of ash used in the Gazos producer gas generator has a min. heat content of 1,012-1,056 cal./cu.m. and a filterable impurity content of 30 mg./cu.m. (60 mg. allowed). The gas produced analyzed: CO_2, 12.0-12.3; O_2, 0.4-0.8; olefins 0.0-0.2; CO, 15.0-16.4; H_2, 14.6-16.0; CH_4, 0.4-0.8; and N_2, 54.6-56.0%.

Suction gas for road traction
Anonymous
Engineer 167, 158-9 (1939).
Problems of utilization of charcoal producer gas for road vehicles in France during past 20 years are discussed.

Swedish gas producer
Anonymous
S.A.E. Journal 46, (1), 26 (1940).
Brief description of Swedish gas producer is given. One hundred kg. of wood corresponds to 20 gal. of gasoline. The loss of power is 30% but the engine can run up to 60 m.p.h. It takes about 5 min. to start it, but when once warmed up it starts readily on gas. Fuel costs are cut about 50%.

Swedish producer gas practice
Lindmark, Gunner
Buss and Coach 1944, 266; Abstr. in J. Inst. Automobile Engrs. 13, (3) XV, (1944).
Of the vehicles using producer gas in Sweden, 55% of the trucks and 73% of the buses are driven by wood gas, while 85% of the private cars run on charcoal gas. The efficiency of these fuels depends on weather, type of vehicle and length of engine performance. Technical and economic advantages of wood and charcoal are considered.

Swedish producer gas vehicles
Anonymous
Engineer 171, 328 (1941).

Swiss lorries on wood gas
Anonymous
Engineer 171, 136 (1941).

Test of British Emergency Producer fired with Australian charcoal
Burstall, A. F.
J. Inst. Engrs. Australia 12, 293-7 (1940).
The paper describes road, dust, power, and stationary tests with forced draft on the British Emergency Producer. Fire temps. and gas analyses of different nozzle velocities were determined along with other pertinent variables, the results being reported in table form.

Town gas for modern road-vehicle propulsion
Downie, C. C.
Gas World 121, 109-11 (1944).
The gas, largely CH_4, is fed from a high-pressure storage tank to a cylinder on the vehicle by means of a flexible hose. The tank is constructed to withstand a working pressure of 4,970 lb./sq. in., and is filled by means of a compressor. The cylinders on the vehicles hold gas at 2,840 lb./sq. in., but cannot be destroyed until a pressure of 6,816 lb. is applied.

Trials of a 4-5 ton producer gas lorry
Anonymous
Engineering 142, 182 (1936).
Road tests of 592 miles were performed on 4-5 ton truck operated on producer gas. The fuel employed was porous coke ("Suncole") in nut form and Irish peat. Both fuels gave about the same volume of gas per cubic content of the generator, but the peat fuel gave better results than coke when engine was under heavy load. The av. speed was 26.3 m.p.h. With the exception of spark plug trouble, the performance was quite satisfactory.

Uncharred wood vs. charcoal
Anonymous
Australian Timber J. 6, 687 (1941).

Untersuchung der Elastizität eines Holzgaserzeugers bei plötzlichen Belastungänderungen
Voelkel, H. and Malchedeck, W.
Automobiltech. Z. 39, 285-7 (1936).
Performance of charcoal-gas producer with sudden load fluctuations such as occur in producers employed on motor vehicles is studied and results given.

Untersuchungen an Fahrzeuggaserzeugern und Reinigungsanlagen
Finkbeiner, H.
J. Soc. Automotive Engrs. 42, 38 (1938).
The efficiency of six different gas producers was tested under the same conditions. The fuels used were wood, charcoal, anthracite, lignite, and bituminous coke. Engine power, efficiency of gas cleaners, fundamental design requirements and characteristics of producer gas are discussed.

Untersuchungen an Holzgaserzeugern
Kühne, G. and Koch, F.
Die Technik in der Landwirtschaft 13, 100-2, 124-7, 153-7 (1932).
A laboratory setup for an extensive investigation of small gas producers (vehicle or stationary, 5 models of three different makes) is described. Engine data: 3.8 x 5.9"; C.R. 4.98:1, 1,100 r.p.m. Beech, fir, and pine wood blocks from 5 to 16 cm. in length having an area from 15 to 60 $cm.^2$ were used as fuel. A Humboldt-Deutz generator with a combination of horizontal (radial) tuyères and overhead (central) air inlet for both air distributions gave a satisfactory tar-free gas if wood of prescribed dimensions was used. For larger sizes the overhead air inlet had to be adjusted. Output was 35 to 41 less than with gasoline (benzine). Wood consumption was from 1.17 to 1.36 kg./hp. hr. Smaller pieces reduced starting time. Condensed water was neutral (litmus and methyl orange). Similar results were obtained with the other makes.

Untersuchungen an Holzgaserzeugern
Kühne, G., Fischer, E. and Koch, F.
The Technik in der Landwirtschaft 13, 216-16, 229-33, 247-52 (1932); Ibid. 14, 6-8 (1933).
Using two Imbert wood gas generators in combination with a truck engine (4.3 x 6.3", C.R. 5.17:1, 1,100 r.p.m.), it was found to take approximately 5 min. before combustible gas was generated and from 15-30 min. before full power (equilibrium) was obtained. The temperature of the gas leaving the generator continued to increase. Smaller wood blocks decreased the time necessary to reach full power. Wood of high moisture content (37%) gives a gas of lower heating value than air-dried wood (17%). Increase of compression ratio from 5.17:1 to 8.89:1 increased power output at 1,100 r.p.m. in one case from 32.1 to 40.8 hp. Power loss relative to gasoline at 5.17:1 was 21% at 8.89:1 and 38% at 5.17:1. Higher compression ratios beyond 9.0:1 would indicate further gains. Size of generators must be adapted to engine size. Both too small or too big generator will result in poor gas, lowering the output. Road tests using gasoline (C.R. 4.3:1) and wood gas (C.R. 4.3:1 and 9:1) indicated that a compression ratio of 9:1 will duplicate gasoline performance more closely. Tables of gas and exhaust gas analyses are given.

Untersuchungen an Schwachgaserzeugern
Mühlschläger, H.
Feuerungstech. 26, 102-6 (1933).
Experiments were carried out with a Deutz gas producer. Efficiency of the fuel and calorific value of the gas depend on the load, air supply, and thickness of fuel bed.

Untersuchungen an zwei Holzgaserzeugern und einem Kompressor der Kromag A.G.
Kühne, G. and Koch, F.
Die Technik in der Landwirtschaft 14, 175-8 (1933).
Supercharging a truck engine at two different compression ratios (6.89:1 and 8.89:1) by means of a "Kromag" blower to about 300 mm., using producer gas fuel, indicated a greater percentage gain at the lower C.R. However, an output equal to that obtained with gasoline at the normal C.R. 5.17:1 was not obtained without overloading the engine. A special filter used to keep tar and dust from getting into the blower was found to be unsuitable for longer periods of time. Authors believe that supercharging is very beneficial but found difficulties in installation.

Untersuchungen zur Weiterentwicklung gasgetriebener Fahrzeugmotoren durch Druckgas-Aufladung
Rixmann, W.
Motor und Kraftstoff, Ver. deut. Ing. Verlag G.m.b.h. pp. 17-23, Berlin 1939. Wissenschaftliche Herbsttagung 1938 des Ver. deut. Ing. in Augsburg.
The article deals with the use of compressed gases as fuels, in particular of compressed illuminating gas. Recommendations are made for further developmental improvement of part-load economy and increase in output to overcome or even exceed loss because of lower heating value. Any improvements should be effected with little or no change in engine design. It is shown that high economy will result if output is controlled through mixture adjustment at full throttle over considerable load range and through throttle adjustment at constant mixture control for the remainder. Much leaner mixtures may be used with illuminating gas than with gasoline. Theoretical and experimental results show that gas injection under pressure will increase power output at approximately the same economy as atmospheric suction.

Utilisation dans la domaine ferroviare des bois créosotes comme carburant de gazogènes
Guillaume, Paul
Mém. soc. ing. civils France 90, 777-93 (1937).
Waste creosoted wood may be used as fuel for producer gas plants in railroad industry. Use of producer gas engines on small locomotives, rail motor cars, locomotive trains, and power plants of railroad ships is described.

Versuche an der gasmachine
Schnürle, Adolf
Automobiltech. Z. 37, 300-3 (1934).
Efficiency and gas consumption were determined as a function of the fuel-air ratio of both producer and illuminating gas.

Versuche an Fahrzeuggaserzeugern
Schulte, F. and Lessnig, R.
Ver. deut. Ing. 74 Hauptversammlung, 78-86, Darmstadt 1936.
A Humboldt-Deutz generator installed on a tugboat had a thermal efficiency of 77% while the over-all brake thermal efficiency of generator and engine was 23%, based on the heating value of the coke used. A five-ton truck fitted with a Humboldt-Deutz generator was used for road tests. Data indicate that exit gas temps. vary greatly with type of fuel and that heating values of producer gas are a function of temp. and depth of charge. Tables giving composition, heating values and properties of anthracite and of various types of coke are given. It is concluded that gaseous fuels are much more economical than Diesel fuels.

Versuche mit Kleinschleppern im Holzgasbetrieb
Meuth, H.
Z. Ver. deut. Ing. 82, 57-60 (1938); Gas Oil Power 33, 140-1 (1938).
Experiments with small tractors in Germany using wood gas are described.

Versuche und Erfahrungen mit Holzgas zum Betrieb von Verbrennungsmotoren
Finkbeiner, H.
Z. Ver. deut. Ing. 79, 205-9 (1935).
Author describes tests and experience with charcoal gas for operation of internal combustion engines. Results obtained with a Buessing engine and Imbert gas generator are given.

Verwendung von Holzgas zum Antrieb von Kraftfahrzeugen
Kühne, G. and Fischer, E.
Die Technik in der Landwirtschaft 13, 75-6 (1932).
Substitution of producer gas for gasoline will result in approx. 40% power loss. Increase in compression ratio, supercharging or addition of gasoline are recommended to improve performance.

Der Volvo-Gaserzeuger für Kraftwagen
Lessnig, R.
Feuerungstech. 29, 97-8 (1941).
An automotive charcoal gas producer built by Swedish automobile factory Volvo similar to the Gohin generator is described. Tests carried out with producer installed on 6,850-kg. motor truck are reported.

The wear of producer gas engines
Australia. Council of Scientific and Industrial Research
Council Sci. Ind. Research Interim Report. No. 3, 1940, 9 pp.; Abstr. in J. Inst. Automobile Engrs. 12, (10), XIV, (1944).
A comparison has been made of engine wear of the two Ford V-8 engines

after 10,000 miles road running. One vehicle ran on gasoline only, the other ran on charcoal producer gas. The producer was of cross-draft type with an experimental gas cleaner, consisting of a cyclone followed by two large sisal and felt filters in parallel. Cylinder wear was 0.00017 in. per 1,000 miles with gasoline, 0.00029 in. per 1,000 miles with gas. The wear of other engine parts is given. Photo-micrographs show that abrasion and fine scoring was greater with gas than with gasoline.

The wear of producer gas engines
Bowden, P. and Kennedy, W. B.
Australia. Council Sci. Ind. Research Interim Rept. No. 1, 1940, 7 pp.
Abstr. in J. Inst. Automobile Engrs. 12, (7), IXX, (1944).
The results are given of road tests on Bedford truck running on charcoal producer gas. The gas-cleaning system consisted of two centrifugal and one oil cleaner, the former being cleaned daily and the latter weekly during the test. A total of nearly 3,000 miles was run. Measurements of wear at the conclusion of the test showed the rate of cylinder wear to be 0.0014 in. per 1,000 miles. It was concluded that wear was being caused by abrasive material in the sump oil.

Weiterentwicklung der Gaserzeuger für Kraftfahrzeuge
Finkbeiner, H.
Ver. deut. Ing. 74 Hauptversammlung, 297-303, Darmstadt 1936.
Principle problems ahead are: Increase in output; better adaptability of gas generator to changing engine demands; simplification of driving technique; improvement of cleaning practice and selection of suitable fuels. Composition of gas was found to be dependent on the location of the air inlet. For improving composition it is recommended (1) large firebox area with consequent low velocities, (2) greater depth of charcoal layer, (3) higher combustion temps. and lowering of heat losses, (4) protection of tar gases from being burned at the air inlet. High ash content (20-23%) is undesirable and may greatly reduce output, such fuels are not suitable. Generators should be built for more than one type of fuel but fuels should be standardized.

Wood and charcoal as motor fuels
Anonymous
Engineering 146, 288 (1938).
Road performances in France of a number of different types of vehicles all equipped with gas producers are described. A variety of vehicles participated such as ligh cars, light trucks, a 27-passenger bus and several heavy trucks. The account tells about starting, cleaning, refueling and general performance of the gas producers.

Wood-gas generator for engines
Kühne, Georg
Automobiltech. Z. 36, 265 (1933).
Compression ratios up to 9:1 were tried. Decrease in efficiency was 20%. No pre-ignition was encountered. Complete cleaning was necessary after 800-1,000 kg. of wood or charcoal was used. It takes 4-5 min. to start the generator. Road performance was poor.

Wood producer gas operation, improving the output of, by supercharging
Thoesch, Max
Automobiltech. Z. 45, 71 (1942).

Wie gross ist der Leistungsabfall von Fahrzeugmotoren beim Übergang zum Gasbetrieb
Rothmann, G.
Mitteilungen aus den Forschungsanstalten - GHH - Konzern 4, (6) 139-44 (1936); Automobiltech. Z. 39, 227-30 (1936).
Investigation of extent of loss in conversion of motor vehicles to gas fuel drive; data on calorific value, theoretical and actual air requirement of producer gas, city gas, pure methane and high-grade liquefied gases (propane, butane); elementary method for sufficiently accurate calculation of loss in efficiency for most important engine types with conversion to use of gas.

Zur Frage des Betriebes von Automobilmotoren mit Sauggas
Schläpfer, P. and Drotschmann, H.
Schweizerische Gesellschaft für das Studium der Motorbrennstoffe 1933, (2), 90.
Engine performance data are reported using charcoal and wood producer gas. Influence of gas composition on engine efficiency is discussed.

Die II Internationale Alpenwertungsfahrt für Nutzfahrzeuge mit Ersatzbrennstoffen. September 8-18, 1936
Finkbeiner, H.
Automobiltech. Z. 39, 618-22 (1936).
Results of second International Alpine contest for motor trucks using substitute fuels are discussed. Some essential details of cars as well as test results obtained with producer gas, alcohol and Diesel fuel are given.

FUEL

Alternative motor fuels
Walter, C. M.
Gas J. 229, 516-19 (1940).
Possibilities for use of gas fuels in motor vehicles are reviewed. In peacetime the producer gas-operated vehicle would have considerable possibilities for work in which the load is continuous. Manufactured gas, coke-oven gas, CH_4 and sewage-sludge gas have continuous possibilities for use in the transport of goods within a limited area.

Analyses of certain South African woods with special reference to their use as producer gas generator fuels
Hall, P. E.
J. Chem. Met. Mining Soc. So. Africa 40, 350-3 (1940).
Some of the Eucalyptus and Acacia woods can be used as fuels in vehicles using producer gas. Ash, 0.3-1.0%; H_2O, 8.5-10.4%. Charcoal yield, 20.7-28.7%; and tar, 10.6-28.0%.

The ash content of charcoal for use in producer gas vehicles
Moore, D.
Queensland, Dept. Forestry, Rept. No. 1, 1940.

The ash content of motor oils used in vehicles operated on generator gas
Thurn, E.
Oel u. Kohle 39, 772-3 (1943).
The ash content of motor oils used in vehicles driven with gas generated from wood amounts to 1.5% after 2,000 km., and as high as 3% and more when brown-coal briquettes, anthracite or coke from low-temp. carbonization were used. In these cases the ash contains, besides the usual components, Na_2O, K_2O, sulfates, silicates and phosphates from the fly ash of the solid fuel; brown-coal ash contains large amounts of CaO and MgO. Part of the ash found in these used oils is due to corrosion products resulting from the attack of SO_2 on metals in the presence of water; wood fuel is less objectionable since it rarely contains S.

Ash content of some Indian fuel wood
Varma, B. S. and Dey, A. C.
Forest Research Inst., Dehra Dun, Leaflet 28, 1942, 5 pp.
Mean ash content is 0.4-5.7% (dry basis) and charcoal ash content is 2.77 times that of the original wood. Experience with mobile producer does not indicate that any general limit for ash can be laid down.

Australian hardwood charcoals with special reference to their suitability for charcoal gas producers
Plante, E. C.
Australia. Council Sci. Ind. Research 14, 191-200 (1941).
Producer charcoals made from River Red gum wood by carbonization at max. temp. of 600°, 450°, and 350° C. are compared. Tar in both the charcoal and producer gas is higher in low-temp. charcoal. A method of analysis for tar in charcoal is described.

Automotive-fuel research problems
Givaudon, J.
Carburants nat. 3, 145-68 (1942).
The chemistry of fuel manufacture from wood should be studied more thoroughly to increase its efficiency.

Bagasse, its peculiarities and equipment for handling it
Anonymous
Proc. 13th Ann. Con. Asoc. técnicos azucar. Cuba 1941.

The behavior of crank case oils in the gas-generator tractors
Rodin, I. V.
Trudy Azovo - Chernomorskogo Inst. Mekhanizatsii Sel'skogo Khoz. 1940, No. 3-4, 110-18; Khim. Referat. Zhur. 4, (3), 96 (1941).
Analysis of samples of spent oils from gas-generators-tractor engines operated on wood and on straw briquettes indicated that the viscosity of the oil remains more nearly constant than in kerosene and naphtha engines owing to the absence of the condensation fuel. The tar content and the coking no. of the oils are higher and owing to the unsatisfactory purification of the gas, the content of ash in the oil is also higher than in motors using liquid fuel. Contamination with alkali-metal salts occurs when straw briquettes are used. This increases the acidity of the oil and facilitates corrosion of the metal.

Better utilization of coal for production of oil and petrol
King, J. G.
J. Inst. Fuel 17, 192-6 (1944).
Prospects of substituting imported gasoline and lubricating oil by (a) products of existing carbonization industries, (b) colloidal fuel, (c) coal hydrogenation, (d) Fischer-Tropsch process, (e) CH_4 from fractionated coal gas, and (f) mobile producers and other developments are reviewed.

Brennstoffe für Fahrzeuggaserzeuger
Klug, Curt
Automobiltech. Z. 40, 466-70 (1937).

Briquets for generating motor fuels
Kobald, Hans
Ger. Pat. 735,359, April 8, 1943.
Potato pulp is used as binder for making briquettes pressed from a mixture of a carbonized material, e.g., charcoal.

Briquetted fuel with a flax straw base
Maidana, G. P.
Industria y quim. 5, 198-202 (1944).
Flax residues with or without linseed-oil cake are mixed with 10% of an agglutinant and briquetted under a pressure of 134 kg./sq. cm. The preferred agglutinant is a crude viscose made from cotton linters and CS_2. The heat value of the fuel is 3,825-4,350 kg./cal.

Briquetting molasses with waste charcoal dust
Ghatak, S. N.
Proc. Sugar Tech. Assoc. India 13, 81-9 (1944).
A mixture of charcoal dust (60 mesh) with 40% by weight of 90° Brix molasses and 10% H_2O is molded under pressure of 1.5 tons/sq. in. for 30 sec. It is then dried at 110° C. and "smoked" at 300° C. in a furnace until fuming stops. The briquettes are a suitable fuel for portable gas generators and have the advantage over charcoal in being more dense and less brittle. The heat of combustion ranges from 11,500-12,000 B.t.u.

British coals, suction gas, and modern internal combustion engines
MacDonald, J. A.
Proc. Inst. Mech. Engrs. (London) 141, (4), 378-81 (1939); Conference on Coal as Fuel for Internal Combustion Engines. Great Britain, June 1939.
Review of the important properties of fuels such as combustible volatiles, ash, undesirable impurities, fuel "doping" and additional fuel features. The article applies to British conditions.

British softwood charcoals
Warne, L.G.G.
J. Soc. Chem. Ind. 63, 191-2 (1944).
Naked-eye or hand-glass inspection usually enables hardwood and softwood charcoals to be differentiated. Hardwood charcoal is free of small vessels but resin canals sometimes may be mistaken for the vessels characteristic of softwood charcoals. Annual rings and their width are variable in all British woods and offer no means of distinction of charcoals. Drawings showing vessels of charcoals made of Douglas fir, Scotch pine, spruce, yew and juniper are given. One Douglas fir showed nearly rectangular pores with comparatively thin side walls.

Charcoal
Danks, F. S.
Cyprus: Forestry Dep. Tech. Pamphlet No. 4, 1939, 6 pp.

Charcoal burning. Portable kiln and pit methods
Australia, Forestry Commission of New South Wales
Sydney: Forestry Commission of New South Wales. Div. of Wood Technology, Pamphlets, No. 5, 1940, 15 pp.

Charcoal for producer gas plant
Ramaswami, S., Dey, A. C., and Varma, B. S.
Forest Research Inst., Dehra Dun, India 1943, Leaflet 35, 6 pp.
Charcoal for replacing gasoline or Diesel oil should be made from sound, preferably hard wood, fully carbonized, of low ash content, and free from foreign mineral matter which causes clinkering. Moisture should be >6%, and since charcoal will absorb up to 10% from very moist air it is best stored in closed containers. A list of 34 suitable Indian hardwoods is given.

Charcoal from British Guiana
Anonymous
Bull. Imp. Inst. 28, 138-46 (1930).
Analyses and technical trials of four native tropical wood charcoals (Yaruru, Soft Wallaba, Ituri Wallaba, and Mora) are considered. They are suitable for use in gas producers. Relative costsof charcoal and gasoline as motor fuelare listed.

Charcoal from Kenya for power purposes
Anonymous
Bull. Imp. Inst. 29, 437-40 (1931).
Four samples of charcoals examined were made from: Mixed forest woods, Eucalyptus globulus, Eucalyptus saligna and Black wattle duced by burning wood in heaps covered with earth. Chemical analyses of charcoals and results of engine tests carried out with one-ton truck fitted with a portable producer gas plant are listed. Comparative costs of charcoal and gasoline are given.

Charcoal supplies
Anonymous
Australian Timber J. 7, 271 (1941).

Chemical aspects of mobile gas producers and charcoal fuel
Gregson, F.
Australian Chem. Inst. J. and Proc. 8, 190-206 (1941).
The ash content of Jarrah wood charcoal is 0.1-1.0% (value depends on the method of carbonization) and moisture content 3.0-8.7%. On a dry, ash-free basis the calorific value of charcoal containing V% of volatile matter is $14,600-15.5\ V^{1.4}$ B.t.u./lb.

The chemistry of gasification with reference to small producers
Bangham, D. H. and Bennett, J. G.
Fuel 19, 95-100 (1940).
A comprehensive investigation into the theory of producer gas generation. The authors explain the various theories associated with the generation of CO. The two-zone theory of gasification is discussed and the evidence against is presented. A revised theory is developed. Fuel reactivity is investigated and the causes of deactivation of fuel are examined.

Coal preparation for production of fuels for automobile gas producers
Meyer, H.
Feuerungstech. 29, 73-9 (1941).

Coal substitutes in gas production. The continuous carbonization of wood in a Glover-West retort at the Chaumont Gas Works
Debernardi, G. and Bonnet, R.
J. usines gaz 66, 182-8 (1942).
Author describes the ovens as well as the requisite quality of wood, the method of carrying through the carbonization, the yield of charcoal and its characteristics. The quantity and composition of the gases and their purification are discussed.

Coals of low ash content. Producer gas as motor fuel
Bertrand, M. F.
Rev. universelle mines 16, 174-85 (1940).
Importance of ash in gas producers; economic aspect of gasification of coal of low ash content are discussed.

Combustible minerals for gas producers
Goupy, M.
Chimie & industrie 48, 133-9 (1942).
Coke, lignite, and mixtures of charcoal and coal as fuels for gas producers on motor vehicles are superior to fuels of vegetable origin in that they have higher density and higher heating value, and inferior in that they possess higher ash content and a higher ignition temp. Their use alone or in mixtures with charcoal is urged because of the insufficient supply of wood charcoal in France.

Combustion characteristics of town gas and its constituents. Further observations on combustion characteristics of town gas
Fuidge, G. H., Murch, W. O., and Pleasance, B.
Inst. Gas Engrs., Commun. Repts. No. 223, 1939, 44 pp.; Ibid. No. 266, 1943, 52 pp.
An attempt has been made to estimate the value of the combustion characteristics of different gases by a method involving the analysis of combustion and aeration diagrams. Such diagrams have been determined for CO, H_2, C_2H_4, CH_4 and for binary mixtures of these gases. From these results it is possible to deduce the probable behavior of such gases in typical appliances. A proposed measure of the practical utility of town's gas is its "flexibility", defined as the area on a combustion diagram within which it will not backfire, blow off, or deposit C.

Combustion of wood-waste fuel
Kreisinger, Henry
Mech. Eng. 61, 115 (1940).
Analyses of California Redwood, Western Hemlock, Douglas Fir, and pine sawdustsare given.

Compressed gas for motor vehicles
Soens, E.
Brennstoff-u Wärmewirt 25, (3), (1943); The Engineers' Digest, Am. Ed.1, (1), 51-2 (1943).
Compressed town gas and methane gas were tried for motor vehicles in Belgium, France, and Germany. There are about 80 tank stations in Belgium whose total capacity is 13,000 m^3 gas/hour; 4,100 m^3/hour is for methane gas and the rest for town gas. Two hundred cars are operating on methane gas and 100 on town gas. The capacity of gas bottles is 10 m^3 gas at 200 kg./$cm.^2$ pressure, the weight is 65-100 kg. They are tested under 300 kg./$cm.^2$ and burst only under 600 kg./$cm.^2$ The pressure regulator reduces the gas pressure to a few mm. water gauge under atmospheric from the pressure in the bottles which varies from

0 to 200 kg./cm. When compared to gasoline the decrease in power is 15% with methane and 20-25% with town gas. The ratio of max. power with gas to max. power with gasoline = 0.825; the corresponding ratio of fuel consumption for gas/gasoline = 1.82. When the carburetor was set to give optimum economy this ratio became = 1.95 m^3 per l. of gasoline. Comparing the over-all costs per mileage with gasoline, there is no saving in using town gas with heavy or lighter types of bottles (100 kg.). For methane gas with heavy or lighter types of bottles there is a saving to 25-30%.

Critical air blast and its significance
Brewin, W. and Thompson, J. K.
Fuel 16, 361-5 (1937).
Critical air blast of number of cokes was determined with ignition times progressively increased from min. "spot" ignition to a point at which whole fuel bed was incandescent to considerable depth. Standardization of test is proposed.

De la nécessité d'adopter un étalon internationale de réactivité et d'etablir des normes permettant la mesure de la réactivité relative des combustibles solides
Droz, A.
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 101-4.
The report points out the necessity of fixing international rules for measuring the relative reactivity of solid fuels. The value of reactivity should be expressed by a figure which will depend on the index chosen as well as on the measuring method employed.

De la production de l'approvisionnement et de la vente des carburants solides
Aubert, F.
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 16-20.
The article deals with the necessity of finding proper quality standards and organized sale distribution of solid motor fuels, in order to insure their wider use.

Determination of sulfur in producer gas with special consideration of vehicle generators
Kühl, E.
Brennstoff-Chem. 24, 1-6, 14-17, 31-2 (1943).
Author investigated the sulfur compounds in the producer gas prepared from various types of coal and coke by mobile generators and the relative amounts of these compounds present. Various methods for determining total S, H_2S, SO_2, COS, and CS_2 are reviewed and the most promising ones are tested. H_2S and COS are the principal sulfur compounds in producer gas. The analytical procedure evolved can be used to determine the

efficiency of devices for the removal of sulfur from producer gas. H_2S (+ any SO_2) is first removed by 25% KOH or 20% NaOH in aqueous solution and then the COS (+ any CS_2) is absorbed in 12.5% KOH solution in absolute alcohol. 36 references.

The development of producer gas propulsion for road transport
Pirie, H. L.
Proc. Inst. Mech. Engrs. (London) 141, (4), 365 (1939); Engineer 167, 419-20 (1939); Gas Oil Power. Annual Tech. Rev. No. 1939, pp. 280-1.
Presented before Inst. Mech. Engrs. London, June 1939.
Producer gas is compared with liquid fuel. Fuels, operating problems, and experiences are discussed.

Diesel fuel from vegetable oils
Furia, Antonio
Rev. brasil.quim. 14, (83), 328 (1942).
Experiments were conducted in Brazil on the dry-distillation of oil-containing seeds, chiefly sunflower seeds and castor oil beans. The composition of condensed distillation product was: Distilled oil, 29.7%; acid liquors, 17.4%; carbon residue, 30.7%; gases 22.2%. The oil can be used for agricultural tractors, and residual carbon in forms of briquettes is suitable fuel for charcoal-burning motors.

English wood charcoals
Warne, L.G.G.
J. Soc. Chem. Ind. 62, 88-90 (1943).
The original features of the wood are not changed in the preparation of charcoal. The identification of the botanical source of wood charcoals is possible when they are in lump form by observations of the size and arrangement of the vessels and the size and frequency of the medullary rays.

Entwicklung und Stand des Sauggasbetriebes in Nutzfahrzeug
Linneborn, H.
Automobiltech. Z. 40, 449-57 (1937).
History and status of producer gas as motor fuel for trucks are discussed.

Ersatz in the engine
Kendall, N. W.
Foreign Commerce Weekly 8, (3), 3-6 (1942).
A review of the current state of development of producer-gas engineering in various countries. Adoption of gasoline engines to producer-gas operation and problems inherent in the chemical nature of the substitute fuels are described.

Etudes des combustibles solides pour gasogenes
Larguier, Louis
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 105-120.
Most suitable materials as fuels for gas generators are lignite, coke, anthracite and wood; the last one considered to be the best. Method of producing gases and their composition is given.

Evaluation of wood charcoal for automobile (producer) fuel
Deringer, H.
Schweiz. Ver. Gas-u. Wasserfach. Monats-Bull. 23, 2-8 (1943).
A laboratory method for rating charcoal has been worked out. First quality charcoal must have an "efficiency number" of over 80%, a second-quality one of 75-80%, and a third of 70-75%. Road tests indicated that the laboratory test could be correlated with speed and hill-climbing tests. Slagging of the ash can also be predicted from the laboratory test. It is also necessary that the wood charcoal should not contain more than a trace of tar.

Examination of some Australian charcoals with special reference to their suitability for charcoal gas producers
Almond, J. N., Holmes, B. H., and Plante, E. C.
Australia. Council Sci. Ind. Research, Pamphlets, No. 103, 1940, 28 pp.

Factors affecting quality of charcoal for producer-gas plant /for vehicles/
Ramaswami, S.
Forest Research Inst., Dehra Dun, India, Leaflet No. 18, 1942, 6 pp.
Author states that infusibility of ash is more important than low ash content. Tamarix and Ficus species of wood are useless because they contain 4% of fusible ash. Data on other desirable properties of charcoal are given.

Fuels and fuel research in Great Britain during the war
Schroeder, W. C.
Mech. Eng. 65, 881-4, 892 (1943).
Problems of immediate importance include development of automotive gas producers.

Fuel briquettes especially for gas producers
Senèze, M.
Belg. Pat. 444,413, March 31, 1942.
Ligneous materials are roasted at a temp. of 250°-300°C. and then compressed under very high pressure (2,000-2,500 kg. per cm.).

Fuel briquettes for gas producers
Carbonisation et Charbons Actifs. Soc.
Belg. Pat. 445,722, June 30, 1942.
Hydrolysis of the cellulosic matter used as binder is carried out with H_3PO_4. The proportion of binder is 1/10 to 1/30. The material to be briquetted contains not over 50% passing a 100- or 120-mesh sieve, but completely passes through a 30- or 40-mesh sieve.

Fuel for producer gas
Devon, John
Petroleum (London) 5, 201, 207 (1942).
Charcoal is the best fuel for gas producers; however, specially cleaned anthracite or coke can also be used. For anthracite, a size of 3/4 x 1/8 in. is recommended for max. CO and calorific value. Ash should be below 4% to prevent clinkering and moisture below 10% to avoid overloading the gas-filtering system. The surface of the fuel may be activated with deposits of Na_2CO_3 to increase reactivity, ease of starting, acceleration, gas production and to make a softer clinker. Vol./wt. relationships, of importance in determining hopper size, are (lb./cu. ft.): Anthracite, 45-50; English charcoal, 16; other charcoal, 18-24; and coke, 20-30. Critical air-blast values (cu. ft./min. needed to maintain combustion) are: Wood charcoal, below 0.01; low-temp. coke, 0.01 to 0.03; bituminous coal, about 0.02; anthracite, 0.034 to 0.04; gas coke, 0.05 to 0.07; and coke-oven coke, 0.065 to 0.085.

Fuel supplies for road vehicle gas producers
Anonymous
J. Inst. Fuel 13, 128 (1940).
British coal and carbonization industries organized commercial and technical committee which has drawn up a specification laying down the characteristics of fuels which can be expected to work satisfactorily in producer gas units.

Fuels-alternative or supplementary to petrol - for use in internal combustion engines for road vehicles. Part II - The future possibilities of gas producers and Diesel engines for transport purposes
Metral, A.
J. Inst. Fuel 2, 204-28 (1929).
A survey of petroleum production in the world and economic considerations of substituting petroleum by fuels obtained from hydrogenation and carbonization of coal. Adoption of existing internal combustion motors for gaseous fuels, e.g., acetylene, methane, coal gas or producer gas from producers using wood or wood charcoal is considered. Methods of gas purification and comparison of engine performance with producer gas and petroleum are given.

Fuels for automobile gas producers
Gillet, A.
Rev. universelle mines 17, 11-20 (1941).
Anthracite and semi-coke containing < 1% of ash are considered suitable fuels. To improve their ignitability the addition of activators is recommended.

Furnace for wood burning
Webber, L. E.
Power 85, 471-3 (1941).
Wood is burned in suspension or on a grate. The first method is used when wood is dry and of uniform small size, the second when wood is wet. The moisture must be driven off from wet wood before burning. The heat for this purpose is supplied by radiation from nearby hot surfaces.

Gas formation in down-draft gas producers using wood
Gwosdz, J.
Feuerungstech. 29, 182-6 (1941).
Processes taking place in direct-flow gas producers are discussed with particular reference to the role of H_2O in the fuel and of the volatile constituents.

Gas for motor fuel from peat
Müller, B.
Allgem. Oel-u. Fett-Ztg. 37, 387-8 (1940).
Peat has certain advantages over coal, (e.g., lower S and ash contents), for the production of motor fuel in vehicle generators. About 650-750 g. of air-dried peat will produce 1 hp./hr.

Gas producer operation with waste wood
List, H.
Oel u. Kohle 37, 811-4 (1941).
Utilization of wood shavings and sawdust in stationary and transport gas producers is discussed. Calorific values range from 125 to 138 B.t.u./cu. ft. for soft wood, beech, etc. The tar content of producer gas from wood is 0.3 g./cu.m.; 7.5 cu.m. of wood = 1 metric ton of gasoline.

Gasification of solid fuels for motor vehicle operation
Schmidt, Kurt
Motortech. Z. 4, 280-8 (1942).
The operation of gas generators suitable for motor vehicles is discussed, including gas-producer processes and producers. German solid fuels and their characteristics are considered. Cooling and purification methods and characteristics of internal-combustion engines are described.

The gasification of wood and wood charcoal
Dupont, Georges
Bull. soc. encour. ind. natl. 141, 1-15 (1942).
Author discusses theories of gasification, the advantages and disadvantages of wood and wood charcoal as fuels, water gas from wood and wood charcoal. The use of producer gas as fuel in engines for industrial and domestic purposes is considered. Several types of French gas generators are described.

Gasification with steam and oxygen
Lege, A. R.
Gas-u. Wasserfach. 83, 669-72, 688-91 (1940).

Gasogens
Miller, R.H.P.
Madison, Wisconsin. U.S. Dept. Agr. Forest Prod. Lab. 1944, 5 pp. (Mimeo. No. R1463).
After a brief statistical summary, purpose of investigation is explained. Almost any type of solid fuel such as nut shells, coke, wood, etc. can

be used; however, a good grade of charcoal is best for reasons explained. Construction, as well as principles of gas generators and operation, are described and precautions are emphasized. Without modification the engine will deliver only about 50% of the power running with producer gas than when running with gasoline. This may partially be overcome through increase of C.R. Results of road tests using charcoal and sawdust are shown.

Les gaz des forêts
Keuleuan, L.
Aerophile 48, 174-7 (1940).
Different types of portable wood gas producers are described.

Les gazogènes pour camions automobiles alimentés à l'anthracite ou au semi-coke. Six années d'experiences techniques et commerciales dans le bassin minier du Gard
Berthelot, C.
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 33-42.
Coal as well as wood can be used satisfactorily as motor fuels, if precautions are observed in the construction of gas generators, cooling and cleaning of the gas.

German portable gas producer practice
Anonymous
Engineering 155, 423-4 (1943).
A general article on German gas producers based on the display of the latest developments at the last Vienna Fair, November 1941. A discussion on four gas producer problems is presented: Suitable fuels, reliability, gas-cleaning, high performance. Seven wood and five anthracite gas producers are described.

Das Holz als Kraftstoff
German Forestry Association
Mitteilungen des Ausschusses für Technik in der Forstwirtschaft; Heft No. 5, 171-234 (1933).
History, economics, theory and practice of wood and charcoal producer gas in Germany; most important types of wood gas generators: Imbert, Deutz, Oberberbach, and "Abogen". Practical experiences with these generators. A brief survey of wood-gas production in countries outside of Germany.

Holzgas als Treibmittel für Lastkraftfahrzeuge
Kühne, Georg
Z. Ver. deut. Chem. 78, 325 (1934);
Charcoal gas is superior to wood gas. The use of charcoal requires a smaller gas producer because of the higher energy content of fuel.

Holzgas als Treibmittel für Leichtol Motoren
Kühne, Georg
Z. Ver. deut. Chem. 77, 1293-4 (1933).

Holzgaserzeuger für Lastwagenantrieb
Finkbeiner, H.
Z. Ver. deut. Ing. 84, 645-50 (1940).
The charcoal produced in the gas generator tends to disintegrate more readily the softer the wood and the higher the temp. of the fire bed. Soft wood gives a poorer performance than hard wood. The wetter the wood, the lower is the heating value of the gas. Wood containing over 36% moisture is not usable. Wood broken in pieces of 30-50 sq. cm. and air-dried to about 15% moisture is best for use in trucks. Seven gas producers are described. 36 references.

Indigenous /Indian/ charcoal kilns
Budhiraja, K. L. and Dey, A. C.
Forest Research Inst., Dehra Dun; Indian Forest Leaflet 53, 1943, 13 pp.
The construction and working of primitive pits and earth- or mud-covered kilns are described. Charcoal yields are 18-30% of the weight of dry wood charged, but the product is not always suitable for use in producers.

The investigation of the tar-producing properties of New South Wales charcoals
Brigden, A. C.
Sydney: New South Wales Fuel Reserve Committee, Report No. 1, 1941, 7 pp.

Die Laboratoriumsmessige Bewertung der Realtionfahigkeit fester Kraft-Stoffen fur Fahrzeuggaserzeuger
Heinze, R., Marder, M., and Rammler, E.
Feuerungstech. 28, 49-54 (1940).
Determination of reactivity of solid fuels for mobile gas producers by laboratory methods. A comparison of the results of practical gasification tests of coke in mobile producers for automobiles with those of ignition point determinations by the Bunte-Kölmel and Bunte-Kölmel-Schroth methods showed that the relations between the gasification vol. and the ease of gasification on the one hand, and the ignition temp. of the gasification on the other hand, are only qualitative. Ignition point determinations are only of limited value in expressing the reactivity of a fuel in a producer.

Manufacture of carbonized fuel briquettes
Squire, L.R.L.
Brit. Pat. 558,694, August 18, 1942.
Coal fines are briquetted with the aid of a binder which has been prepared from peat by the method claimed in Brit. Pat. 417,923; the briquettes are then carbonized.

The manufacture of charcoal for producer gas vehicles
Queensland Government. Producer Gas Committee. Brisbane: Queensland Government, Producer Gas Committee 1940, Bulletin No. 3, 8 pp.

Manufacture of charcoal in portable kilns
Donald, G. H.
Dept. Sci. Ind. Research (Brit.), Forest Products Research Records No. 29, 20 pp. (1939); Further Notes on the Manufacture of Charcoal in Portable Kilns, Ibid. 10 pp. (1941).
The experimental kiln consisted of a thin steel cylindrical shell, 6 ft. in diameter and 5.5 ft. high, fitted with inlet air pipes and outlet fuels, and closed by a slightly conical lid, also of sheet metal. The rate of burning was regulated by the outlet flues, pyrometers being used to follow the progress of burning. The majority of tests were made on beech cordwood. The size of wood carbonized ranging from 2 to 20 in. in diameter and from 3 to 4 ft. in length. With a kiln of this capacity, yields of 450-550 lb. of well-made charcoal of an av. volatile content of 12% should be obtained per burn. Two methods for determining the volatile matter in charcoal are described.

Manufacture of mixed briquettes of coal and wood charcoal
Berthelot, C.
Génie civil 117, 165-9 (1941).
Author discusses the production and properties of briquettes made from mixed mineral, coal and charcoal, and their use in gas producers. The briquettes are manufactured at the Vernon plant in France.

Manufacture of town's gas from water-gas and its economic aspect
Gerdes, H. C.
Gas-u. Wasserfach 84, 485-92 (1941).
It is possible to convert water gas of low calorific value, 2,600 kg.-cal./m^3 into town's gas of higher calorific value, 4,300 kg.-cal./m^3. This is accomplished by desulphurization, conversion of part of CO into CO_2 ($CO + H_2 \rightleftarrows CO_2 + H_2$), washing out of CO_2, and conversion of CO into CH_4 ($CO + 3H_2 \rightleftarrows CH_4 + H_2O$) or ($2CO + H_2 \rightleftarrows CH_4 + CO_2$ and $CO_2 + 4H_2 \rightleftarrows CH_4 + 2H_2O$).

Methods for the manufacture of domestic automobile fuels
Kjøsen, H.
Ingeniøren 51, 107-11 (1942).
In Denmark peat is dried in a stream of cold waste gas and then coked in a stream of hot gas. It gives 40% coke which can be used for generator gas, and 8% tar which can be used as a Diesel fuel or converted into lubricants.

Mixed briquets for generators
Rolland, M.
Carburants nat. 4, 81-3 (1943).
Coal and wood tar or pitch are used as binders in the manufacture of mixed briquettes. The advantages and present status of manufacture of mixed briquettes are discussed.

Mobile producer gas units and charcoal fuel
Gregson, F.
J. Inst. Engrs. Australia 13, 15-21 (1941).
Progress in introduction of producer gas in Australia, particularly with farm tractors; problems associated with producer gas and charcoal development over past 12 months.

The modern portable gas producer
Goldman, B. and Clarke-Jones, M.
J. Inst. Fuel 12, 103-40 (1939)
A comprehensive survey of the gas producer field. Many aspects of the subject are considered: Past developments, theory, producer-gas plants, design of generators, gas purification, fuels, gas producer, fuel consumption, engine design, performance. Drawings of the following producers appear in the paper; Humboldt-Duetz; Wisco; C.G.B.; Koela updraft; Malbay; Hansa; Imbert; Panhard; Sabatier Fiat; Koela downdraft; Gohin-Poulenc; H.S.G. Brandt; Koela double draft.

The motor fuel problem in Sweden
Lindmark, Gunner
Engineering 153, 481-3 (1942).
A review of development of producer gas in Sweden during the war. Wood fuel most suitable for intensive operation and long journeys, charcoal better for intermittent service (passenger vehicles). Following is the proportion of wood and charcoal used in vehicles in October 1941: 40% wood, 60% charcoal. The proportion for trucks was 48% wood, 52% charcoal and for private cars 27% wood and 73% charcoal. The peak figure of producer gas plants in operation was 73,250 reached in December 1941.

The operation of the Q.F.S. vented brick kiln
Queensland Government. Producer Gas Committee
Brisbane: Queensland Government. Producer Gas Committee 1940, Bulletin No. 4, 8 pp.

Peat coke
Leemans, E. T.
Brennstoff-u. Wärmewirt 23, 197-201 (1941).
The advantages of charcoal or peat coke over others as fuels in motor vehicle generators are discussed. Experimental trips were made with various fuels and results given.

Peat for automobile gas producers
Wirtz, F. C.
Brennstoff-u. Wärmewirt. 23, 78-80 (1941).
Wood gas producers can easily be converted to make them suitable for peat. Excavated peat is preferable to pressed peat in spite of its higher ash content. The water content should be ≯25%. Analyses of Dutch peats are given.

Planning of charcoal supplies with special reference to the position in Western Australia
Anonymous
Australian Timber J. 7, 318 (1941).

Producer gas and charcoal
Queensland Government. Producer Gas Committee
Brisbane: Queensland Government. Producer Gas Committee 1940, Bulletin No. 2, 16 pp.

Producer gas as a substitute for motor fuel
Egloff, G. and Truesdell, P.
Petroleum Refiner 22, (10), 146 (1943).
A survey of producer gas-driven vehicles in Europe is given. Because of ample oil resources it is unlikely that producer gas will be used as a motor fuel in the U.S.A.

Producer gas for agricultural purposes
Freeth, E. N.
J. Dept. Agr. W. Australia 16, 371-414 (1939).

Producer gas for motor traction
New South Wales Forestry Commission
Sydney: Forestry Commission of New South Wales, Pamphlet, 1941, 24 pp.

Producer gas for motor transport
Allcut, E. A.
Automotive and Aviation Inds. 89, 38-40, 42, 44, 60 (1943); Eng. J. 25, 223-30 (1942).
The requirements of a fuel and the chemistry of the process of producer gas manufacture are discussed. Early and modern mobile producer plants are reviewed; diagrams and graphs included. The problems of fuels, cooling, and cleaning the gas, and operations and installation are discussed.

Producer gas for road transport
Ward, S. G. and Morison, W. J.
J. Inst. Fuel 15, 131-46 (1942); Gas J. 238, 289, 329, 421, 423 (1942).
Fuel requirements for road transport are discussed. Activated anthracite of suitable size is best for general use. Methods for operation and control of the producers are given.

Producer gas-future fuel for gas turbines?
Swain, P. W.
Power 88, (5), 310-11, 350b, 350c (1944).
The gas turbine using oil fuel will probably be applied to mobile power plants in the near future; its application to stationary power plants of high capacity will be delayed until coal can be used as the fuel. When the coal is gasified at the power plant, producer gas is undoubtedly the most practical, and it is possible that the slagging producer, using a small portion of the air from the main compressor, would be an economical unit to use. With present limitations in operating temp. of the turbine, the N content of the producer gas would not be a hindrance. If the gas is to be manufactured at the mine and transmitted to the power plant, water gas or other gases of higher heating value would be preferable. It is believed that the power required for compressing the gas would not lower the plant efficiency appreciably.

The production of charcoal for gas producers
Barton, C. A.
Rev. quím. ind. (Rio de Janeiro) 12, (138), 19-23 (1943).
The charcoal producer adopted by the Light and Power Company of Rio de Janeiro is a light, knockdown, metal unit that can easily be operated and transported. Control, product quality, and yield are better than with the usual pit method. Burning requires 24 hours. Air comes in at the top central hole and leaves through the four vertical pipes. By-products are not recovered. When the gases issue clear instead of cloudy all holes are plugged for 10 hours to permit cooling. Wood air-dried 3 months to 15% moisture gives about a 22% yield of charcoal, compared to a mixture possible of some 25%. The av. temp. of the hot charge is 500°. The dried charcoal is easily inflammable, yields 7,900 cal./g., is mechanically strong and has suitable moisture and ash content for gas producers.

The production of lump charcoal from pine sawdust without a binder
Basore, C. A. and Moore, O. C.
Alabama Polytech. Inst., Eng. Expt. Sta., Bull. No. 14, 33 pp. (1942).
Pine sawdust, used in preparing briquettes, was heated to 400° for 14 min. at 300 lb./sq. in. pressure applied at a rate of 1 min. for 20 sec. The briquettes were then transferred to a retort maintained at 400° and heated in the absence of air for 25 min. for smoke removal. Drop and tumbler tests taken before and after weathering for 8 weeks gave the following results: Before weathering 90.67%, 93.46% held by 1-in. screen; after weathering 87.71%, 91.6% held by 1-in. screen. The ignition temp. of the briquettes was 325°, sp. gr. 0.51, and the heating value 12,378 B.t.u./lb. Operating cost for a plant with a capacity of 2,000 tons of briquettes per day is given.

Reactivity of solid fuels
Orning, A. A.
Ind. Eng. Chem. 36, 813-16 (1944).
Reactivity indices are presented for 68 coals and 35 cokes. The indices, varying inversely with reactivity, are found to correlate with the volatile content on the dry ash-free basis.

The recovery and use of methane as automobile fuel in Italy
De Capitani, Serafino
Kraftstoff 16, 76 (1940).
CH_4 can be obtained from natural gases and sewage. Representative analyses are given. Combustion characteristics of CH_4-air mixtures at various temps. are shown.

Report of the committee on the emergency conversion of motor vehicles to producer gas
Great Britain, Department of Scientific and Industrial Research.
London: H.M.S.O., 1940, 27 pp.

Report on the construction and operation of the New South Wales forestry charcoal producing plant
Youhotsky, M. J.
Sydney: Forestry Commission of New South Wales, 1941, 15 pp.

Report on the effects of grading or sizing of charcoal on gas producer performance
Johnston, A. K.
/Sidney?/ New South Wales, Australia, Forestry Commission, Div. of Wood Technology, 1941, 3 pp.

Review of position of substitute fuels
Australian Commonwealth. Standing Committee on Liquid Fuels, 7th Report.
Canberra: 1940, 7 pp.

Ricerche eseguite per l'agglomerazione del carbone vegetale ed applicazione del prodotto ottenuto ad un gassogeno sperimentale
Tondani, Carlo
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 21-31.
A summary of the investigation on different kinds of wood tar used as a base for the preparation of briquettes. Beech tar having carbonization point about 420° C. proved to be most suitable.

Risultanze pratiche dopo lungo esercizio sull'autotrazione a gas naturali o da generatori
Sirtori, Sandro
III° Congresso Internazionale del Carbonio Carburante, 3rd Session, Gaseous Fuels, Rome, September 1937, pp. 1-41.
Physical and chemical characteristics are given of several gaseous fuels

including their behavior at low temp., corrosive influence of sulfur, formation of carbon deposits on nozzles. Possibility of employing bituminous rock gas oils and vegetable oils are discussed.

Solid carbonaceous fuels
Rammler, E.
Motortech. Z. 4, 303-9 (1942).
Solid carbonaceous fuels are discussed, as well as types of gas producer processes and tar-free fuels: Anthracite, bituminous coal semicoke, and brown-coal semicoke. Results of producer tests are presented for semicoke from brown and bituminous coal. Tar-containing fuels such as brown-coal briquettes, lump brown coal, high-volatile coal and special fuels are also considered. Solid carbonaceous fuels suitable for gas generators are discussed such as anthracite, bituminous and brown coal, semicoke, brown-coal briquettes, lump brown coal and others. Some producer test results are given.

The solid fuels for gas producers
Bacqueyrisse, Louis
Carburants nat. 4, 1-9 (1943).
Methods of producing charcoal in mobile or stationary ovens are described in detail. The efficiency of production as well as products obtained is discussed.

Solid motor fuels
Ostwald, Walter
Kraftstoff 16, 3-5 (1940).
The use of solid motor fuels is briefly outlined. Recent developments and further possibilities are discussed.

The standardization of the critical air blast test
Bangham, D.H.B. and Phillpotts, G. C.
Gas World 117, 618, 648 (1942).
The discrepancies in the results are caused by: (1) Variation in the method adapted in packing the fuel bed. (2) Variation in the energy output of the heater if it is below 160 w. (3) The restriction of the airflow at the fuel bed in an apparatus of the original Riley design in which the bed is laid in a shallow cup.

A study in charcoal. Being a research on charcoals made from exotic woods grown in the Union of South Africa
Cleghorne, W.S.H.
Trans. Roy. Soc. So. Africa 11, 23-43 (1924).

Substitute fuels
DuPont, Georges
Bull. soc. chim. 8, 629-43 (1941).
Discusses chemical and thermodynamic properties of fuels for gas combustion engines: Alcohols, ethers, ketones, C_2H_6, CO and H_2 gases; wood and wood charcoal. For larger vehicles gas generators should be introduced, for lighter vehicles compressed gases are more satisfactory.

Substitute fuels for automobiles
Troesch, Max
Schweiz. Bau-Ztg. 116, 235-9 (1940).
Wood gas, charcoal gas and C_2H_2 are to be considered as substitutes for gasoline in Switzerland. While C_2H_2 has attained no importance, portable generators, Imbert for wood and Hera, Carbusol, Volvo, Autark and Franz equipment for charcoal, have found practical use. Operation and equipment are described.

Substitute fuels for motor vehicles
Lierde, F. van
Tech. wetensch. Tijdschr. 10, 48-56 (1941).
A good fuel should be dry, dust-free, purified and low in ash. Various types of generators, cooling devices, purifiers, and mixtures for gas-air are described. Transportation with benzene and producer gas is discussed.

Substitute motor fuels in dark Africa
Aubreville, M. A.
Carburants nat. 3, 281-7 (1942).
Author reviews the use of wood and wood charcoal in gas producers. Wood is the most valuable raw material in Africa because of the many ways in which it can be used. Test data are presented.

Substitute propellants for motor purposes
Ruegg, R.
Schweiz. tech. Ztg. 1941, 467-75.
A discussion of the technical and commercial possibilities of replacing gasoline by producer gas, C_2H_2, paraldehyde, and H_2.

Substitutes for gasoline in France
Kalmanovsky, E.
Petroleum (London) 5, 203-4 (1942).
Peat containing 30-40% of moisture and 20-25% of ash used in the Gazes producer gas has a min. heat content of 1,012-1,056 cal./cu.m. and a filterable impurity content of 30 mg./cu.m. (60 mg. allowed). The gas produced analyzed: CO_2, 12.0-12.3; O_2, 0.4-0.8; olefins, 0.0-0.2; CO, 15.0-16.4; H_2, 14.6-16.0; CH_4, 0.4-0.8; and N_2, 54.6-56.0%.

Suitability of charcoal from different varieties of wood as fuel for gas producers on motor vehicles
Deringer, H.
Schweiz. Ver. Gas-u. Wasserfach. Monats-Bull. 21, 187-9 (1941); Brennstoff Chem. 23, 19 (1942).
Charcoal from oak, birch, and birch was found to be much superior to that from pine wood.

Suitability of fuels for gas producers
Rouyer, Pierre
Carburants nat. 2, 261-77 (1941).
The properties of coal, wood, charcoal, coke, semicoke, and their mixtures as producer gas fuels are discussed. The requirements as to reactivity, coking temp., inflammability, combustibility, porosity of wood for gasification by drying and carbonizing are described.

Technical and economic study of packaged fuel
Parry, V. F.
U.S. Bur. Mines, Rept. Investigations 3757, 1944, 45 pp.
For a packaged fuel to be satisfactory it should have an av. compressive strength not less than 85 lb./sq. in., an apparent sp. gr. not less than 1.04 and an abrasion loss in the modified tumbler test not greater than 15.0%. Ten lb. of starch binder per ton of coal is sufficient. The chief causes of trouble are improper mixing and insufficient drying.

Thermal and physical properties of fuel briquettes made from agricultural and other waste products
Jefferson, B. R.
Agr. Eng. 17, 199 (1936).

Les travaux en cours au laboratoire de machines de "L'Institut Portugues de Combustiveis"
Droz, A.
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 77-81.
A review of the research conducted in the laboratory of the Portuguese Institute of Fuels. The purpose of the research was to find the best method of obtaining producer gas from charcoal for road and rail transport.

The use of domestic motor fuels with special attention to the use of producer gas from wood in fixed and mobile plants
Berger, Wilhelm
Gas-u. Wasserfach 85, 400-7 (1942).
Wood, wood charcoal, brown-coal briquettes and anthracite and their use in gas producers are discussed. Gas producer reactions are reviewed, and a description is given of stationary and mobile gas producer plants. The economics of such producers and their maintenance are discussed.

Use of gas-coke as a substitute fuel in France
Gros, C.
Gas-u. Wasserfach 85, 515-18 (1942); Gas World 117, 300-2 (1943).
In order to promote the substitution of coke for wood and charcoal as a fuel in producers on vehicles the following standards were established: Ash, not more than 11%; moisture, not more than 4%; S, not more than 0.75%; dust, not more than 1%; and m.p. of ash, below 1,250°. The size-grading gave slightly quicker times of ignition, and was preferable on short trips, while the 4-15 mm. size was better on long trips.

Utilisation dans la domaine ferroviare des bois créosotes comme carburant de gazogènes
Guillaume, Paul
Mém. soc. ing. civils France 90, 777-93 (1937).
Waste creosoted wood can be used as fuel for producer gas plants in railroad industry. Producer gas engines on small locomotives, rail motor cars, and for power plants in railroad shops are practicable.

Utilisation des bois créosotes comme carburant de gazogènes
Guillaume, Paul
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 128-132.
General considerations of wood as fuel for vehicles. Economic and technical advantages of wood charcoal for traction engines. Method of carbonization and possible application of charcoal "Geka" for railway transport.

L'utilisation du bois et du charbon de bois comme carburant sur les automobiles
Vaulltrin, Robert
Génie civil 110, 163-4 (1927). Presented before Société d'Encouragement pour l'Industrie Nationale.
Review of French experimental studies of utilization of wood and charcoal for manufacture of producer gas to be used as fuel for automotive vehicles; cost data and records of performance.

Utilization of low-temperature coke from brown coal and bituminous coal
Rammler, E.
Gas-u. Wasserfach 85, 437-444, 468-474 (1942).
Brown coal must be briquetted before carbonizing in order to produce fuel of satisfactory size distribution (50% >10 mm.). It has higher average S and ash contents than the corresponding product from bituminous coal. Ash of brown coal has a wider temp. range of fusion than bituminous coal although the initial fusion temps. are approximately the same. Various designs of grate are described. Both coals are suitable fuels for stationary producers yielding a tar-free gas of 1,250-1,400 kg.-cal./m^3. For mobile producers the ash contents are in most cases too high.

Vergasung von Anthrazit und Steinkohlenkoksen im Fahrzeuggaserzeuger
Lang, K.
Z. Ver. deut. Ing. 83, 472-3 (1939).
Results of experiments with small gas producers using anthracite and low- and high-temp. cokes are given. Changes of calorific value with different fuels per run of 100 min., variations in heating value with degree of saturation, and influence of grain size and porosity on the reaction are illustrated by graphs. The cost of fuel is discussed.

Vergasungsversuche mit maschinell zerkleinertem Holz (Schnitzelholz)
Kühne, G. and Koch, F.
Die Technik in der Landwirtschaft 15, 15-17 (1934).
A special machine is able to effect crushing of wood in one operation, thus reducing considerably the cost of fuel used in wood gas generators. The description of the machine as well as the size of crushed pieces of wood are given. Comparison of large and small pieces of wood on the performance of gas generators is illustrated by tables and graphs.

Die Verwendung von pflanzlichen Abfällen als Gaserzeugerbrennstoff
Jaeger, Lujo
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 121-7.
Various fuels of plant origin similar to charcoal are considered. Waste materials such as pressed cakes of Italian grape stones can be converted into high-grade fuel for gas generators. Fuel of this type is called vegetable coke; owing to its lack of sulfur it has a large field of application beyond the combustion in gas generators.

War emphasizes the inferiority of petroleum substitutes
Logan, L. J.
Oil Weekly 107, (6), 13-6 (1942).
A survey of the application of substitute motor fuels such as: Ethanol, methanol, coal, wood, charcoal, natural gas, city gas, refinery gas and sewage gas in Europe and South America is presented. Relatively poor performance and high cost of these fuels are emphasized.

Waste materials from the palm-oil industry as fuels
Bokhorst, E. W.
Polytech. Weekblad 35, 426-8 (1942); Ibid. 36, 19-20 (1942).
Thermal energy values are given for pulp and bark.

Die Weiterentwicklung des Holzgaserzeugers
Lutz, Hans
Abstract in Chem. Fabrik 14, 123 (1941).
Best heating value for gas from pine, 15% moisture = 1,275 kcal./m^3 or mixture value = 610 kcal./m^3.

Wie gross ist der Leistungsabfall von Fahrzeugmotoren beim Übergang zum Gasbetrieb
Rothmann, G.
Mitteilungen aus den Forschungsanstalten - GHH - Konzern 4, (6) 139-44 (1936); Automobiltech. Z. 39, 227-30 (1936).
The extent of power loss in conversion to gas fuelwas investigated. Data of calorific values, theoretical and actual air requirement of producer gas, city gas, pure methane and high-grade liquefied gases (propane, butane) are given. An elementary method for sufficiently accurate calculation of loss in efficiency for most important engine types with conversion to use of gas is given.

Wood and charcoal as fuel for vehicles
Ruedy, R.
Natl. Research Council Can. Ottawa N.R.C. No. 847, 1940, 24 pp.

Wood and charcoal as motor fuels
Anonymous
Empire Forestry J. 17, 70-4 (1938).

Wood and charcoal as motor fuels
Jenkins, J. H. and Guernsey, F. W.
Ottawa: Can. Dept. Mines and Resources, Forest Circ. No. 47, 1936, 16 pp.
Reuse of Charcoal as Motor Fuel Supplement to Circ. 47, November 3, 1939.
Gas producer theory and operation and a method of manufacturing charcoal are briefly considered. Tests on British Columbia charcoal are reported. The results of road tests using charcoal made from five different indigenous species of wood (Red alder, cottonwood, Lodgepole pine, Sitka spruce and Douglas fir) are given. Some of the results discussed are: Operating cost per ton-mile; ton-miles per lb. of charcoal; power development; hardness and freedom from dust. Red alder and Douglas fir cordwood appear to be superior to the others.

Wood charcoal and peat coke. Preparations in Jutland of carbon for gas producers
Arnbak, L. and Damgaard, J.
Kem. Maanedsblad nord. Handelsbl. kem. Ind. 22, 144-8 (1941).
Preparation of charcoal and peat coke in Denmark is described. For use in gas producers on motor vehicles charcoal made in the so-called French steel mounds is preferred, as contamination with sand is thereby avoided.

Wood charcoal and portable charcoal kilns
Clarke-Jones, N.
Ind. Chemist 14, 396-401 (1938).

Wood charcoal in vehicle gas producers
Anonymous
Engineering 153, 477 (1942).
Use of wood charcoal for motor vehicles in British dominions. Figures of Australian and Canadian charcoal consumption; calorific value and chemistry; physical characteristics.

Wood gas and charcoal gas in gas works. The use of charcoal as fuel for vehicles
Zollikofer, H.
Schweiz. Ver. Gas-Wasserfach., Monats. Bull. 21, 207-24 (1941).
The production of charcoal and gas from beech, pine, fir, oak, linden, and birch woods are described. Lignite was also included. The gasification took place with or without incandescent zone. The gas obtained was of 3,050 to 4,300 cal./cu. m. heating value; the yields were 27.1 to 59.0 cu. m. For the lignite the heating values were 2,760 to 3,510 cal./cu. m., yields were 32.2 to 48.9 cu. m. The charcoal made was not in all cases generally usable. Details are given.

Wood refuse as fuel
Davidson and Co.
Power and Works Engr. 36, 288-90 (1941).
The advantages of waste-wood firing are: Economy of fuel, ease of control, efficient burning, and low ash content. The use of sawdust as fuel for internal-combustion engines is briefly discussed.

HAZARDS

Dangers in the use of automobile gas producers and their avoidance
Hecht, Alfred
Deut. Molkerei-Ztg. (Hildesheim) 56, 782-3 (1942).
Precautions to be observed in the operation of gas producers are outlined.

The danger of CO poisoning in the use of generator motor vehicles
Klebe, H.
Arbeitsschutz 1943, 273-4.
A case of fatal poisoning during operation of a charcoal gas generator is reported and precautions are discussed.

Poisoning with producer gas
Schiötz, E. H.
Gas-u. Wasserfach 85, 63 (1942).
The danger of CO poisoning when operating producer gas motor vehicles is discussed, and safety rules are suggested which must be rigidly enforced.

Spontaneous ignition of wood meal and sawdust
Böttcher
Feuerschutztech. 21, (3), 41 (1941); Feuerungstech. 29, 236 (1941).
Suggestions on methods of avoiding fires are given.

MISCELLANEOUS

Australian standard specifications for wood charcoal for use in gas producers for vehicles and tractors, Emergency Standard No. (E) CD1, 3001-1941
Standards Association of Australia
Sydney: Standards Association of Australia, 1941, 8 pp.

Bibliography on gas producer; practice period 1902-1936
The Iron and Steel Institute
Iron Steel Inst. Bibliography Ser. No. 6, 1938, 72 pp.

I carburanti sussidiari nella legislazione italiana
Pandolfelli, Michele
III° Congresso Internazionale del Carbonio Carburante, 5th Session. Economic Statistics and Legislature, Rome, September 1937, pp. 27-34.
A short review of legal dispositions passed in Italy with a view of fostering and rendering compulsory the use of substitute fuels in automotive engines.

Gas producers for motor vehicles, their design and operation
London, Science Museum
London: Science Museum, Science Library Bibliography Series No. 415, 1941, 8 pp.
References covering the period 1930 to June 1938.

Gas producers in Brazil
Anonymous
Foreign Commerce Weekly 8, (11), 14 (1942).
To counteract the shortage of gasoline, further measures have been taken to increase the use of gasogene apparatus. The National Gasogene Commission was completely reorganized and its functions extended to promote the use of gasogene equipment for tractors, and other vehicles, including automobiles.

The lubrication of methane motors and producer-gas motors
Ghilardi, Sandro
Atti III° convegno naz. metano 2, 441-2 (1941).
Advantages of a special lubricant ("Metanol") are outlined.

New developments in gas production
Jordan, H.
Brennstoff.-Chem. 16, 148-52 (1935).
Review of Ger. patents for 1934.

La propagande internationale pour le gaz des forêts
C.I.B. (Commission Internationale d'Utilisation du Bois)
III° Congresso Internazionale del Carbonio Carburante, 1st Session, Solid Fuels, Rome, September 1937, pp. 73-75.
An outline of the scope of activities of the International Commission for Utilization of Wood.

Rallye des carburants nationaux 1927 and subsequent years
Anonymous
Automobile Club, France (1927).

The revival of the gas producer
Willans, K. W.
J. Junior Insts. Engrs. 50, 254-67 (1940).

PURIFICATION

Coal substitutes in gas production. The continuous carbonization of wood in a Glover-West retort at the Chaumont Gas Works
Debernardi, G. and Bonnet, R.
J. usines gaz. 66, 182-8 (1942).
The process is described and data given.

Fuels-alternative or supplementary to petrol - for use in internal combustion engines for road vehicles. Part II - The future possibilities of gas producers and Diesel engines for transport purposes
Metral, A.
J. Inst. Fuel 2, 204-28 (1929).
A survey of petroleum production in the world and economic considerations of substituting petroleum by fuels obtained from hydrogenation and carbonization of coal. Adoption of existing internal combustion motors for gaseous fuels, e.g., acetylene, methane, coal gas, and producer gas, from producers using wood or wood charcoal is considered. Methods of gas purification and comparison of engine performance with producer gas and petroleum is given.

Filter media for fine filters of portable producer-gas plants
Verman, L. C., Nair, K. A., Khanna, M. L. and Das Gupta, S. K.
J. Sci. and Ind. Research (India) 3, 251-58 (1944).
Sateen-type (picks > ends) cotton drill was superior to eight other textiles and felts as final filter medium in a portable gas producer.

Gas producers as applied to transport purposes
Lowe, R.
J. Junior Insts. Engrs. (London) 50, 231-53 (1940).
A general review of portable gas producers.

Gas producers for motor vehicles
Westerkamp, L.
Oel u. Kohle 38, 1106-8 (1942).
Portable gas producers of the up-, down- and horizontal-draft types are described. Dust and S must be carefully removed from producer gas derived from the use of various types of mineral fuels; S causes corrosion due to corrosive Si-S compounds. Both mechanical and chemical purifications are used; active C is an important purification agent. Gas must be cooled to at least 30° to secure max. engine efficiency. As compared with other fuels, wood has the advantage of low (and soft) ash, absence of S, uniformity of chemical composition, ready ignition and formation of a very active tar. Peat is also a good fuel, but its ash must not exceed 3%, S content must be low, and the moisture content 5%, ash 5%, combustible S 1%, and volatile matter 8%. The weight of fuel required in g. per hp. per hr. is given for wood, charcoal, low-temp. coke and anthracite.

Gas producers for motor vehicles and their operation with forest fuels
Great Britain. Imperial Forestry Bureau
Oxford: Imperial Forestry Bureau, Technical Communications No. 1, 1942; Intern. Sugar J. 44, 135 (1942).
Theory of producer gas; the generator; cleaning and cooling apparatus; mixing valve and controls; layout, weight and cost os producers. Loss of power and performance; driving and maintenance, charcoal fuels; operating costs; wider aspects.

Gas producer sets primarily intended for use with motor vehicles. Gas cleaning and filtering
Sentinel Waggon Works (1936) Ltd. and Alley, S. E.
Brit. Pat. 539,794, March 19, 1940, and January 17, 1941.
Two filters are provided in series which are readily detachable for cleaning; the first filter is tubular and operates by inward flow.

Gasification of solid fuels for motor vehicles operation
Schmidt, Kurt
Motortech. Z. 4, 280-8 (1942).
Fuels and their properties are discussed as well as cooling and purification methods for the producer gas and characteristics of internal combustion engines.

Les gazogènes
Lepoivre, A.
La Nature 1941, (6), 73-9.
Gas producers; history of development, design, and operation; gas cooling and purification; conditions to be fulfilled in installation of producer with special reference to automotive producers.

The modern portable gas producer
Goldman, B. and Clarke-Jones, N.
J. Inst. Fuel 12, 103-40 (1939); Engineer 166, 712, 740 (1938).
A comprehensive survey of the gas producer field. Many aspects of the subject are considered; past developments; theory, producer-gas plants; design of generators; gas purification; fuels; gas produced; fuel consumption; engine design; performance. Drawings of the following producers appear in the paper: Humboldt-Deutz, Wisco; C.G.B.; Koela updraft; Malbay; Hansa; Imbert; Panhard; Sabatier Fiat; Koela downdraft; Gohin-Poulenc; H.S.G. Brandt; Koela double draft.

Producer gas for motor transport
Allcut, E. A.
Automotive and Aviation Inds. 89, 38-40, 42, 44, 60 (1943); Eng. J. 25, 223-30 (1942).
The requirements of a fuel and chemistry of the process of producer gas manufacture are discussed. Early and modern mobile producer plants are reviewed; diagrams and graphs included. The problems of fuels, cooling and cleaning the gas, and operations and installations are discussed.

Producer gas vehicles
Anonymous
Engineering 153, 133 (1942).
A filter is described employing water as the filtering medium. Its use, in connection with additional upper-cylinder lubrication, has reduced cylinder wear for gas producer vehicles to a figure comparable with that for gasoline engine vehicles.

Purification of generator gas for internal-combustion engines
Svedlund, A.
Brit. Pat. 561,673, August 26, 1942.
The gas is cooled (to remove part of its moisture), reheated to its dew point, and then purified by passage through a fine-mesh sieve. Preferably a cyclone separator is provided between the preheater and final purifier.

Purifier for motor-vehicle gas producer
Kohlepp, A.
Automobiltech. Z. 45, 388-94 (1942).
Gas purification devices employing gravity, inertia, cooling, filtering, activated carbon, tube- and plate-type "electrofilters" with high voltages are described and compared. Electrofilters are satisfactory for solids, but as yet have not been tried with S compounds--this is now under investigation. It is necessary to clean out the electrofilter approx. every 500 km. either by washing out with a stream of H_2O or by using special tools. The cost of such an installation is about 500-600 Reichsmarks. Electricity used is about 100-130 w. For heavy-duty expensive motor vehicles the costs are not too high, but they are for small machines.

Untersuchungen an Kleingasreinigern für Fahrzeuggaserzeuger
Anonymous
Feuerungstech. 28, 73-82 (1940).

Vehicle gas producers for tar-free fuels and gas purifiers therefor
Finkbeiner, H.
Z. Ver. deut. Ing. 85, 591-599 (1941).
The Klockner-Humboldt-Deutz, Wisco and Daimler-Benz gas producers, using coke as fuel, and various producer gas purifiers, e.g., van Tongeren, Imbert, and Südgas, are described. Producers using brown coal briquettes as fuel are only in the experimental stage in Germany. Two recent designs of producer using wood as fuel, viz., Ostmark and Janka, are included.

THEORY

Brenntechnische Bewertung technischer Case
Brückner, H. and Löhr, H.
Z. Ver. deut. Ing. 80, 1275-9 (1936).
Combustion properties of some industrial gases are determined. The rate of flame propagation of CH_4, CO and H_2 with air or oxygen is measured and importance of "specific flame performance" is discussed. For evaluation of pure and industrial gases, equations for calculation of flame performance are given.

The conversion of petrol vehicles to operate on low-pressure town gas
Chamberlain, E. A. C.
Engineering 150, 337 (1940).
It was found that town gas gives a smaller power output than gasoline; the article deals with theoretical considerations involved, such as, the net calorific value of the fuel-air mixture, the specific volume change on combustion, the latent heat of evaporation of the fuel if liquid, the specific gravity of the fuel-air mixture, and the radiation from the flame and hot products.

Experiences with producer gas from wood for automobiles
Kyrklund, H.
Trans. 2nd World Power Ind. Conf., Berlin 8, 470-87 (1930).
Summary of the research on the operation of automobiles with three different types of producers using wood is given. One kg. of wood is equal to about 210 g. of gasoline. Power drop was 40%.

Graphic representation of gas producer reactions
Neuman, K.
Forsch. Gebiete Ingenieurw. A11, 246-9 (1940).
Gasification reactions in the air gas producer are given. Comparison is made between theoretical curves and experimental data showing that in producer practice the chemical equilibrium $C+CO_2 \rightleftarrows 2CO$ is attained.

Influence of gaseous constituents on the decomposition of CO in mixtures
Baukloh, W. and Spetzler, E.
Arch. Eisenhüttenw. 13, 223-6 (1939).
The effect of CO_2, N_2, H_2 and H_2O vapor on the $2CO \longrightarrow C+CO_2$ reaction in the blast furnace is discussed.

Mathematical graphical treatment of gasification processes
Gumz, W.
Feuerungstech. 29, 177-82 (1941).
Calculations based on the degree of decomposition of CO_2 and steam in the combustion gas from the oxidizing zone and degree of formation of CH_4 in the reducing zone are given. These values agree with data obtained in gas producer tests using coke as fuel.

Mechanism of the steam-carbon reaction
Warner, B. R.
J. Am. Chem. Soc. 65, 1447-51 (1943); Physics Abstracts 46, 243 (1943).
Interpretation of available data on the steam-carbon reaction corroborates the generally accepted conclusions that the primary products of the reaction are CO and H_2 and that CO_2 is formed from the water-gas reaction which tends or reaches equilibrium.

Problems of wood gas power
List, Hans
Österr. Chem.-Ztg. 40, 173-7 (1937).
Curves representing the combustion velocity of H, CO and CH_4 are given. It is possible to obtain compression ratios of 1:14 without knocking. The increase of H in the gas decreases its knocking value.

Producer-gas and gas-producer practice
Wheeler, R. V.
Fuel 2, 15-21, 48-53, 72-7, 106-10, 156-60, 182-6, 219-21, 269-72, 293-6, 334-8, 369-72 (1925).
The following subjects are treated: Chemical reaction in generator, action of air on C, the equil. $CO_2+C \rightleftharpoons 2CO$, action of CO_2 on C, action of steam on C, relative rates of the reactions in the producer, the ash-zone, combustion-zone, reaction-zone, distn.-zone and temp. distribution in the producer. When heating and power are the chief considerations a steam saturation temp. of the blast of not much more than 50-5° should be employed and the CO_2 should average not much over 3.5% with a blast superheated to approx. 250°. A description of various types of producers is included.

Theory of the gas producer
Denis, F.
Rev. universelle mines 85, 353-63 (1942).

Theory of gas production
Hubendick, E., Olsson, S., and Axelson, S.
Tek. Tid. 72, No. 42, Automobile-och Motorteknik 73-80, No. 47, 81-8 (1942).
Equations for the production of gas from wood are given, and the air consumption and gas composition are ascertained for a numerical example. Through the addition of 70-90% H_2O vapor to the gasification air, the max. yield of gas is obtained. Even with H_2O vapor addition as high as 400% (of air), both gas yield and generator efficiency are still higher than those obtained with dry fuel and air alone. These equations consider only a perfect process. In the actual process, there are both heat losses and incomplete equilibria. The direct formation of CH_4 from CO_2 and H_2 is small in the gas generator. What CH_4 is obtained comes from the decomposition of tarry materials. Addition of H_2O vapor lowers the reaction temp. considerably, as does the addition of CO_2 so that addition of 17% CO_2 does not alter the heating value of the generator gases.

Thermodynamics of producer gas combustion
Oleson, A. P. and Wiebe, R.
Ind. Eng. Chem. 37, 653-60 (1945).
Results are given which will enable calculations of all necessary engine data for two representative producer gas mixtures. It is shown that supercharging an engine using producer gas to 20 lbs. per sq. in. will produce closely the same power as is obtainable for the same engine unsupercharged. Higher compression ratios are desirable; however, compression ratios above 8:1 may require costly engine modifications. The calculated data represent limiting values under the assumed conditions and in practice the values will be much lower.

Über die Bildung ein Zwischenzone zwischen Oxydations und Reduktionszone im Gaserzeuger und das Verhalten des Wasserdampfes bei sehr hoher Gas Geschwindigkeiten
Gwosdz, J.
Brennstoff. Chem. 21, 269-73 (1940).
In the small cross-draft type producers which use high gas velocities, the gasification zone has restricted dimensions due probably to the formation of intermediate zone between the oxidizing and reducing zones. Most of CO is formed in this intermediate zone.

Wood carbonization, the process taking place in the wood-gas producer
Tobler, J.
Ver. gas-u. Wasserfach., Monats-Bull. 20, 113-21, 143-9, 165-9 (1940).
An Imbert downdraft type producer was used in experiments having four successive zones: Drying zone, carbonization zone, oxidation zone, and reduction zone. Normal wood gas consists of 12.7 CO_2, 0.2 C_nH_m, 21.4 CO, 19.4 H_2, 2.6 CH_4, 43.7% N; heating value is 1,412 kg.-cal./cu.m. Immediately after interrupting operations values change respectively as follows: 10.4, 0.2, 33.9, 28.7, 3.7, 23.1%; 2,122 kg.-cal./cu.m. Data are included which show the effect of moisture content of wood and ease of carbonization upon operation of producers.

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*Addendum

Brazil studies postwar use of producer gas
Anonymous
Foreign Commerce Weekly 21, (5), 34 (1945).
J. L. Meiller, president of the Thermal Energy Commission of Brazil advocates continued use of producer gas as fuel and development of producer gas equipment in order to make Brazil independent of foreign fuel supplies. He suggests perfecting producer gas apparatus, improvement of quality of charcoal, and use of high compression engine having, however, interchangeable parts with normal gasoline engine. One of the possible applications would be small stationary units for farms.

Production at gasworks of coke for mobile gas producers. I - Factors affecting manufacture of reactive coke at gasworks
Greenwood, H. I. and King, J. G.
II - Production of coke suitable for mobile gas producers
Rhead, T.F.E. and Pickering, E. T.
Inst. Gas Engrs., Commun. Repts. No. 281, 50 pp. (1945).
Coal of suitable coking power will yield coke having a critical air blast value approximately 0.04 under conditions described. Such coal is available in sufficient quantity and the coke produced is suitable for the Government Emergency gas producer. Best performance was obtained when careful grading gave not less than 80% between 3/4-1/4 in. Production cost was 3 pounds and 9 shillings per ton. For competition with gasoline it must sell below 5 pounds sterling per ton. On runs with frequent stops, coke should be activated by Na_2CO_3. Part II gives description of the process and discusses the feasibility of full replacement of Great Britain's gasoline supply by producer fuels in emergency.

Situation actuelle des gazogènes
Ballu, T.
Rev. agr. France 73, 20-21 (1941).

Les tracteurs agricoles a gazogènes
Ballu, T.
Rev. agr. France 74, 223 (1942).

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*The Index of Authors does not include these references.